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Cold Creek in the proposed Cramahe Hill Forest and Wildlife area. This is an excellent trout stream.

Department of Energy and Resources Management

HON. GEORGE A. KERR Q.C., Minister

J. C. THATCHER, Deputy Minister

A. S. L. BARNES, Director, Conservation Authorities Branch

lower trent region conservation report 1970

volume I

report and plan

ONTARIO

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SUMMARY

The lower portion of the Trent River watershed and the adjoining small streams flowing directly into Lake Ontario comprise an area of 795 square miles, ranging in elevation from 246 feet above sea level to 1,200 feet but with a climate generally modified by the proximity of Lake Ontario.

In the north-eastern section, shallow soils and areas of exposed limestone bedrock make sub-marginal farms, which are being abandoned and may become available for forest or wildlife areas. Elsewhere, Authority land is covered with deep glacial deposits. The central section contains till moraines, till plains and eskers, with some lacustrine deposits in the form of clay plains and sand plains. The southern section is dominated by kame moraine, drumlins and sand plains. In these sections the opportunity for more intensive agriculture is greater, but here the urban competition for land also increases.

The major watercourse, the Trent River, originates well beyond the Authority boundaries and is under control as part of the Trent Canal system. The smaller streams present no major flood threat, but control of bank erosion and pollution require attention here as well as in the Trent River. Flood damage in urban areas could increase sharply if the encroachment of development on the flood plains of rivers is not strictly controlled by zoning.

The area is capable of additional development for sport fishing, hunting, nature observation and enjoyment of its scenic features.

Following the initial period of lumbering and settlement, the area experienced a decline in rural population, but less severe than in many parts of Ontario. In recent years some gains in industry, the attraction of the Trent River as a tourist waterway and the increased demand for estate properties have started a reversal of this trend.

Intensification of agriculture has been mainly in tobacco farms, tree fruit orchards and livestock operations, with increased corn production to support the latter. Woodland production is well below its potential, with Dutch elm disease depleting the lowland stands and poor regeneration and under-stocking being common in the upland hardwoods. The existence of a pulpwood market for low-grade hardwood should assist in better management. Christmas tree growing is important, constituting one quarter of the present plantations.

Careless logging, lack of windbreaks and increased cultivation of corn crops contribute to erosion losses of soil with consequent muddying of streams and siltation of reservoirs. Tile drainage outlets need protection from erosion and grass waterways are recommended in a number of locations.

The principal sources of pollution are identified and the Authority is advised to co-operate with the Ontario Water Resources Commission in monitoring its streams and in educating the public to avoid practices which contribute

to water pollution. Mention is made of other factors which impair the environment and the need for education, planning and controls to reduce this impairment.

Channel improvements and reservoir sites on Cold Creek are recommended for further investigation. A flood warning system is proposed to facilitate co-ordinated operation of private dams in the area. Installation of improved farm ponds is advocated.

Demonstrations and education are suggested to reduce erosion through better land-use by contour tillage, use of windbreaks, establishment of grass waterways, exclusion of cattle from eroding stream banks and better planning of logging operations. Protection of drainage tile outlets is advocated. Areas suitable for pasture improvement have been separated from those requiring private reforestation.

A total of 32,250 acres of submarginal land is identified as suitable for public acquisition for forestry purposes.

Twenty-two wildlife areas are recommended for private improvement or public acquisition. The Authority is urged to encourage persons owning suitable habitat to install Wood Duck nesting boxes and those owning trout streams to open them to public fishing on a fee basis. The Authority should demonstrate stream improvement for fish habitat by use of deflectors and other devices and should urge its municipalities to preserve wildlife habitat by restricting roadside spraying to those areas where the need is established.

Recommendations are made for careful long-range planning to produce a high quality environment for recreation, and a conservation area classification and zoning plan is described. Twenty-two potential conservation areas are de-described briefly for the Authority's consideration, five hiking trails and eight scenic trails are outlined. Stress is laid on the need for liaison and integration of Authority recreational developments with those of other agencies to produce a co-ordinated regional recreation program.

Part 6 of the report presents a Conservation Plan designed to clarify Authority policy and provide a basis for orderly implementation of measures to ensure maximum benefits to society from the natural resources of the Lower Trent Region. Co-operation with other governmental bodies is stressed and a realistic ceiling of 0.5 mills on provincial equalized assessment is proposed for the general levy on member municipalities.

Development priorities have been set forth for an initial five-year period, to be considered as part of a broader, long-range program. The priorities will be adjusted from time to time as conditions warrant and a complete review will be made after the first five-year period. Many of the programs are of a continuing nature, not necessarily costly, but requiring an early start and continued vigorous promotion. In the more specific projects stress is placed on early acquisition of the lands required for later development.

The Plan has been discussed with the executive committee of the Lower Trent Region Conservation Authority and approved in principle. Its implementation, however, will depend on the enthusiastic co-operation, financial and otherwise, of the participating municipalities, the members of the Authority and the private citizens of the Lower Trent area.

INTRODUCTION

As early as 1955, discussions were held regarding the possibility of forming a Conservation Authority in the Lower Trent area, but it was not until 1968 that a favourable vote of the municipalities concerned resulted in the establishment of the Lower Trent Region Conservation Authority by Order-in-Council 1962/68 dated May 16, 1968, "with jurisdiction over:

(i) that part of the Trent River watershed within the municipalities of the Towns of Campbellford and Trenton, the Villages of Brighton, Colborne, Frankford, Hastings and Stirling and the Townships of Alnwick, Brighton, Cramahe, Haldimand, Huntingdon, Murray, Percy, Rawdon, Seymour and Sidney, except the watersheds of the Crowe River and other streams entering the north side of the Trent River west of the mouth of the mouth of the Crowe River,

(ii) the watersheds of all streams entering the Bay of Quinte between the mouth of the Trent River and the point where the west boundary of the Meyers Creek watershed meets the shore of the Bay of Quinte, and

(iii) the watersheds of all streams within the County of Northumberland entering the Bay of Quinte and Lake Ontario between the mouth of the Trent River and the point where the west boundary of the Township of Haldimand meets the shore of Lake Ontario."

At its first meeting the Authority passed a Resolution requesting the Minister of Energy and Resources Management to undertake a study to assess the conservation problems and opportunities within the Authority area. This study was made in the summer of 1969, at no cost to the Authority, and is the basis of this report. At the beginning contact was made with such sources of existing information as the Ontario Department of Agriculture and Food and the Department of Lands and Forests. Field studies were designed to enlarge and to fill gaps in this information. The studies covered conservation aspects of land, forest, water, wildlife, recreation and community planning. Survey crews consisted of university students in these subjects under the direction of the experienced section heads of the Conservation Authorities Branch, Department of Energy and Resources Management.

Conditions reported are, of course, those at the time of survey in 1969 and may, in some few instances, have changed even in the short time that has elapsed since the survey was completed.

The report is designed primarily for the guidance of the Lower Trent Region Conservation Authority in formulating and carrying out a program of conservation in its area of jurisdiction. The implications of the report are, however, considerably broader. It should provide additional guidance to other agents, government or private, concerned with management of resources in the region and to municipalities in their planning for orderly development of rural

and urban areas. Above all, it is hoped that this report will promote a co-ordination of effort by all agencies to achieve a program of maximum effectiveness for the people of the Lower Trent Region.

Volume I, Conservation Report and Plan, while in itself a working document for the Authority, is of general interest to all who concern themselves with conservation in the Region. It has been printed in sufficient quantity to allow for public distribution. Volume II, Appendix, contains additional technical material, including maps and charts, of primary concern only to those responsible for making decisions on a conservation program. It is printed in limited quantity for Authority members and other persons involved. The companion volume, History, gives the background of resource development in the area. It is of such general interest that it also has been printed for public distribution.

Acknowledgements

Grateful acknowledgement is made of the assistance in the survey and preparation of this report received from many members of the Authority and other residents of the Lower Trent Region. Information of value was contributed by Mr. J. Duncan of the Bata Shoe Company, Batawa, by Mr. R. Cox, Department of Planning and Geography, University of Waterloo and by Mr. J. Dobbin, School of Landscape Architecture, University of Toronto.

Appreciation is expressed also for the excellent co-operation received from the staffs of the following agencies and government departments:

Loyalist College, Belleville
Town of Trenton
Hydro Electric Power Commission of Ontario
Ontario Department of Agriculture and Food
Ontario Department of Highways
Ontario Department of Lands and Forests
Ontario Department of Municipal Affairs, Community Planning Branch
Canada Department of Energy, Mines and Resources
Canada Department of Transport, Trent Canal System

In addition to the senior staff members whose names appear on the list of "Technical Staff", the following members of the Conservation Authorities Branch had major responsibilities in conducting the survey and preparing this report:

Engineering	M.G. Lewis, B.A.Sc., P. Eng.
Forestry	P.M.R. Harvie, B.Sc.F., R.P.F.
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Recreation	H.D. Moffatt, B.A.

Section 1
LOCATION

The Lower Trent Region Conservation Authority, formed by Order-in-Council 1962/68 on May 16, 1968, lies on the north shore of Lake Ontario and encompasses all or parts of the following municipalities:

The Township of Alnwick,
The Village of Brighton,
The Township of Brighton,
The Town of Campbellford,
The Village of Colborne,
The Township of Cramahe,
The Village of Frankford,
The Township of Haldimand,
The Village of Hastings,
The Township of Huntingdon,
The Township of Murray,
The Township of Percy,
The Township of Rawdon,
The Township of Seymour,
The Township of Sidney,
The Village of Stirling,
The Town of Trenton.

All of these are participating municipalities and appoint members to the Authority. The total population in 1968 was 47,338.

The area under the jurisdiction of the Authority is 795 square miles and comprises the lower part of the Trent River watershed and the watersheds of the smaller streams entering the Bay of Quinte and Lake Ontario from the west boundary of the Meyers Creek watershed (just east of Trenton) to the west boundary of the Township of Haldimand.

The Lower Trent Region Conservation Authority is, therefore, in the middle range in size and density of population among the conservation authorities in Ontario.


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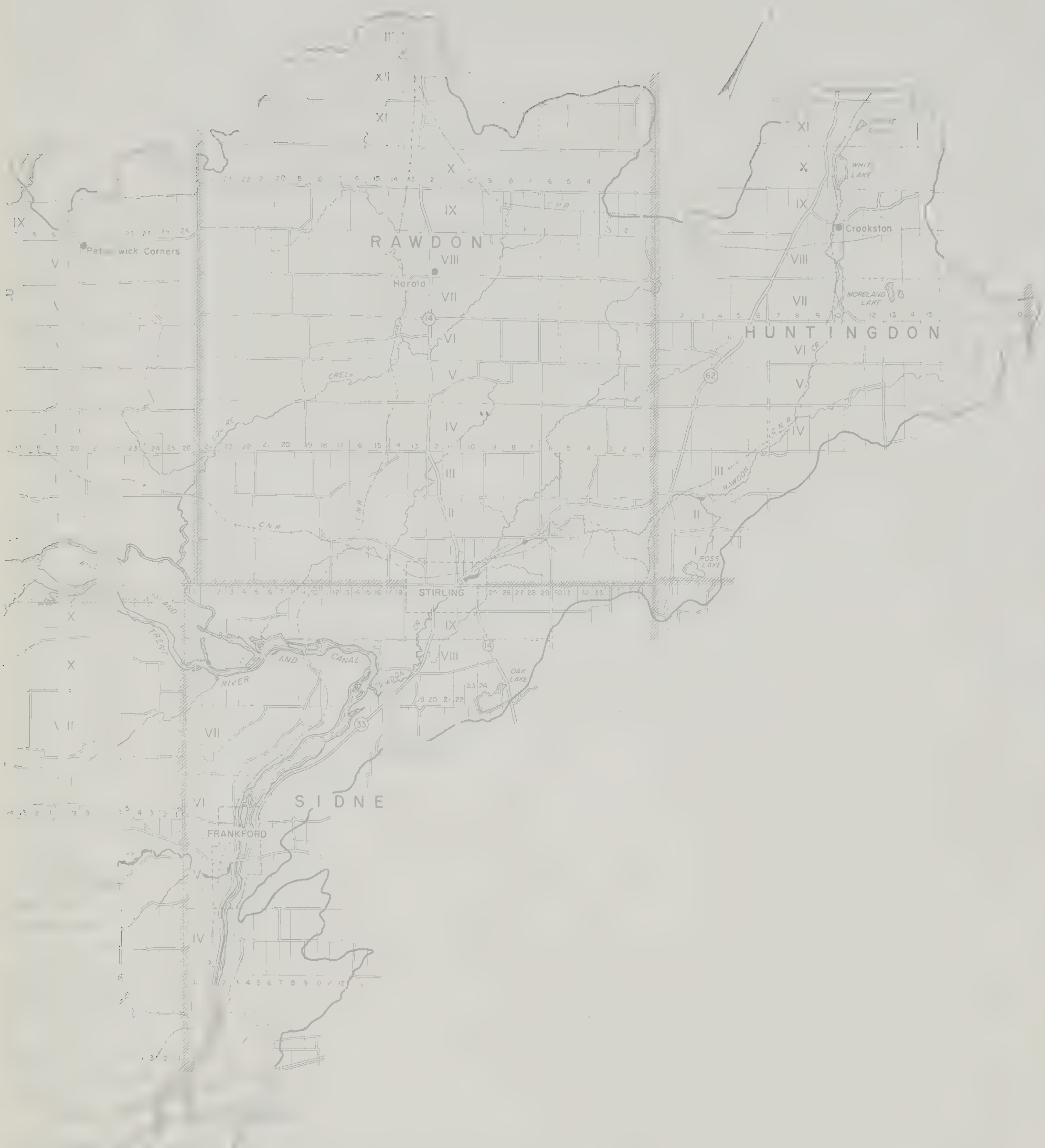
VIII
MUNICIPALITIES



MUNICIPALITIES

Section 2

CLIMATE

The climate* of an area depends on its location within the world-wide circulation of the atmosphere, but the influence of this circulation is modified by physiographic features.

Climate is the sum of past weather experiences. The conditions of temperature, moisture and light tend to be repeated seasonally since, for the most part, they are controlled by the sun, seas and land contours. The local climate also may be profoundly affected by the proximity of water and local topographic relief.

In the Lower Trent watershed, where elevations range from 246 feet above mean sea level, the average level of Lake Ontario, up to 1,200 feet, topography exerts a significant influence on local temperature and precipitation. However, average values of these elements across the watershed show only minor variations. The year-round open water of Lake Ontario has a pronounced effect in moderating the climate of the region from the more extreme conditions which might normally be expected to prevail in a continental location along latitude 44 degrees N.

Warm summers and cool winters are features of the temperature regime on the Lower Trent basin. The average temperature for the year is 45 degrees F. January, the coldest month, averages 19 degrees and July, the warmest, 69 degrees. The recorded temperature extremes are 32 degrees below zero and 102 degrees above.

The mean annual frost-free period is about 140 days. The average date of the last spring frost is the second week in May, while that of the first autumn frost is the last week of September.

The mean annual precipitation over the watershed is about 33 inches, of which the average rainfall is 26 inches and the annual snowfall about 70 inches.

The average monthly precipitation ranges between two and three and one-quarter inches; the heavier amounts occurring during December and May.

The average rainfall for the five-month growing season, from May to September, is 13 and one-half inches.

The prevailing wind is from the south-west. The average wind speed for all directions is 9m.p.h. A maximum gust speed of 96 m.p.h. has been recorded at Trenton.

The following tables+ of detailed weather data from the Trenton Airport and Stirling stations are indicative of the values prevailing on the Lower Trent watershed near and away from the influence of Lake Ontario.

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* Brown, F.M. et al., *Climate of Southern Ontario,* Meteorological Branch, Canada Department of Transport, Toronto, Canada. 1968 U.D.C. 551582 (713)

\+ *Temperature, Precipitation and Wind Tables for Ontario,* Meteorological Branch, Canada Department of Transport, Toronto, Canada, 1967

Table 2-1

CLIMATE DATA – TRENTON AIRPORT

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Mean Daily Temperature (Deg. F.)	20.4	21.4	30.2	43.8	55.0	65.4	70.1	68.3	60.8	49.4	37.8	24.8	45.6
Mean Daily Maximum Temperature	28.1	29.0	38.1	52.6	64.4	74.6	79.5	77.8	69.8	58.0	44.7	31.9	54.0
Mean Daily Minimum Temperature	12.7	13.8	22.3	35.0	45.6	56.2	60.7	58.8	51.8	40.8	30.9	17.7	37.2
Maximum Temperature	56	56	73	81	92	96	102	97	95	78	73	57	102
Minimum Temperature	-25	-26	-20	9	26	34	42	38	29	19	-3	-23	-26
Mean Rainfall (inches)	1.22	1.01	1.81	2.49	3.21	2.29	2.57	2.54	2.75	2.76	2.49	1.82	26.96
Mean Snowfall	17.4	14.8	10.2	2.2	T	0.0	0.0	0.0	T	T	6.3	14.2	65.1
Mean Total Precipitation	2.96	2.49	2.83	2.71	3.21	2.29	2.57	2.54	2.75	2.76	3.12	3.24	33.47
No. of Days with Measurable Rain	5	4	7	10	12	8	8	8	9	9	11	6	97
No. of Days with Measurable Snow	12	10	7	2							3	8	42
No. of Days with Measurable Precipitation	15	12	12	11	12	8	8	8	9	9	13	13	130
Maximum Precipitation in 24 Hours	1.47	1.35	2.11	1.60	2.80	2.22	2.78	2.81	1.95	2.54	1.59	3.82	3.82

Wind Direction	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Calm
Annual % Frequency of Winds	5	4	6	5	4	2	2	2	3	7	13	9	6	8	8	6	10
																	All Directions
Average Wind Speed in m.p.h.	9.2	8.1	8.9	9.6	8.9	8.9	9.2	10.9	9.5	11.2	12.0	13.3	12.7	13.7	12.0	10.9	10.2
Maximum Observed Hourly Speed	65 WSW																
Maximum Observed Gust Speed	96																

Table 2-2
CLIMATE DATA – STIRLING

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Mean Daily Temperature	17.8	18.7	28.5	42.9	54.4	64.2	68.7	67.4	58.8	47.5	35.7	22.2	43.
Mean Daily Maximum Temperature	26.5	27.5	36.8	52.4	65.8	75.6	81.2	79.9	70.1	57.9	43.5	30.2	54.
Mean Daily Minimum Temperature	9.1	9.9	20.2	33.4	43.0	52.8	56.2	54.9	47.5	37.1	27.8	14.2	33.
Maximum Temperature	55	55	79	88	92	95	98	98	97	85	75	58	9
Minimum Temperature	-31	-32	-26	5	24	30	38	34	24	15	-6	-31	-3
Mean Rainfall	0.76	0.71	1.31	2.28	3.10	2.00	2.93	2.75	2.89	2.63	1.84	1.20	24.4
Mean Snowfall	17.1	14.9	12.4	2.6	0.1	0.0	0.0	0.0	T	0.0	7.7	13.5	68.3
Mean Total Precipitation	2.47	2.20	2.55	2.54	3.11	2.00	2.93	2.75	2.89	2.63	2.61	2.55	31.2
No. of Days with Measurable Rain	4	4	6	11	12	10	9	8	10	10	10	6	100
No. of Days with Measurable Snow	13	12	9	2	*					*	5	11	52
No. of Days with Meas. Precipitation	16	14	13	12	12	10	9	8	10	10	14	15	143
Maximum Precipitation in 24 Hours	1.41	1.40	1.32	1.18	2.32	1.81	2.87	3.21	2.39	2.41	1.17	1.10	3.23

Wind Direction	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Calm
Annual % Frequency of Winds	7	4	7	4	4	2	3	2	6	5	11	7	11	8	7	4	8
																	All Directions
Average Wind Speed in m.p.h.	6.8	7.4	7.1	7.6	6.4	7.5	6.8	8.0	6.8	7.5	7.2	8.2	8.0	9.9	7.7	7.9	7.0

Maximum Observed Hourly Speed 50 W

* Occasional Occurrence

Section 3
PHYSIOGRAPHY AND GEOLOGY

1. BEDROCK GEOLOGY

The Lower Trent Conservation Authority lies within the St. Lawrence Lowlands, with the bedrock consisting primarily of sedimentary limestones of the Ordivician Period. These Trenton-Black River limestone formations are exposed at the surface in the north-eastern extremities of the Authority (elevation 575 feet) as well as along the Trent River and the present shoreline of Lake Ontario (elevation 250 feet).* The limestone bed dips in a south-westerly direction as a consequence of sedimentary deposition within the South-western Ontario basin; and the Frontenac Axis (with its Precambrian rocks) that lies to the north-east of the Authority forms the outer rim of the basin, which was an early predecessor of the present Great Lakes system.

The depth of these limestone beds has not been extensively studied, although one diamond drill exploratory hole set near Ogden Point, on the shoreline of Lake Ontario still encountered Trenton limestone at a depth of 200 feet below the present surface level of the limestone formations.+ Although the bedrock geology of the area is quite interesting from a geological point of view, the present physiography, with its very pronounced topographical features, can be attributed largely to glacial activity.

2. TOPOGRAPHY

The diversification of topographical features evident in the Authority is primarily due to the glacial and interglacial periods that occurred during the Pleistocene era, especially during the last Wisconsin ice stage (10,000 years ago). It is during this stage of the ice age, with the advancing and retreating of the glacial ice front along the shore of Lake Iroquois, the predecessor of Lake Ontario, that many physical features were established.

The consequences of these fluctuating glacial fronts took the form of till plains, kame moraines, till moraines, sand plains and clay plains. In addition to this already complex physiography, several extensive eskers were created during the glacial activity and extensive drumlinization also has occurred within the area.

On the basis of its glacial features, the Authority can essentially be divided into three physiographic regions. The north-easterly region displays a relatively flat to gentle rolling topography due to the underlying limestone bedrock. The second and more extensive region is generally located throughout the central segment of the Authority and displays a more complex topography due to glacio-fluvial

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* Mirynecn, Edward; *Pleistocene Geology of the Trenton in Campbellford Map Area;* Ph.D. thesis University of Toronto 1963; 16.

\+ Hewitt, D.F *The Limestone Industries of Ontario,* Industrial Mineral Circular No. 5, Ontario Department of Mines, Toronto, 1960, 49.

and lacustrine types of deposition. The southern segment of the Authority, with its rolling and steeply sloped hills, and beach terraces descending to Lake Ontario, makes up the third physiographic region. The features found in this region have definitely been moulded by the waters of Lake Iroquois, previously mentioned in this section.

Briefly, the surface features of these three physiographic regions can be outlined as follows:

a. North-easterly region

The limestone bedrock of the Trenton-Black River formations lies relatively close to the surface and the fragmentary limestone and the igneous rocks derived from the Frontenac Axis create a bouldery surface on the hummocky topography.

b. Central region

The glacio-fluvial and the lacustrine depositions created the main land features found in the central region. Glacio-fluvial deposits assisted in the establishment of till moraines, till plains and eskers. The lacustrine deposits of the Trent Embayment, an extensive inland bay of Lake Iroquois that generally inundated the central portion of the Authority, created the clay plains and the sand plains along the beach terraces.

c. Southern region

The lower segment of the southern region is almost entirely of sand plain or kame morainic features, which were, to a great degree, altered by extensive wave washing that occurred during the Lake Iroquois stage. Hence, the topography displays gently rolling hills, sloping terraces and incised valleys, as the fine textured sands are quite susceptible to erosional processes.

An examination of the physiographic features of an Authority provides some insight into the forces that formed the landscape. It can also provide some means of comprehension of the problems of land use and soil conservation, because knowledge of these features can assist in considering common conservation problems. Anticipated problems associated with various land forms are:

Limestone plain: droughty thin soils, difficulties in agricultural crop production, pockets of poor drainage, heavy reforestation requirements and streambank erosion.

Clay plains: areas of imperfect drainage, sheet and rill erosion in cultivated areas, gullies, streambank erosion and bank slumping, need for grass waterways.

Sand plains: wind and water erosion, droughty soils, streambank erosion, need for grass waterways. marginal fields requiring reforestation, some poorly drained depressions.

Drumlins: erosion on steep slopes, marginal hillsides, wind exposure, possible stoniness, poorly drained areas.

Till plains: stoniness in hills, imperfect drainage in undulating areas, erosion, gullies along rivers and drainage ditches.

Moraines and eskers: marginal hummocky lands needing reforestation,

droughty, sandy and gravelly soils, wind and water erosion, poorly drained depressions, the need for wildlife management, unsuccessful attempts at drainage, flooding of wet-site forests.

Beach and shorecliffs: unstable banks, gully erosion, bouldery deposits.

3. SOIL GEOLOGY

Glacial deposition and topography were two important contributors in the development of the Authority's soils. Glacial depositional material can exist either as a heterogeneous and unstratified drift material, commonly referred to as till; or as stratified drift material. The latter has been partially sorted by ice-melt waters and the resultant material is often found in such land forms as outwash plains, eskers or kames. Hence, depending upon the glacial material, the resultant soil type can be associated with an appropriate land form.

The partially sorted outwash sands and gravels can be found in the kame moraines and sand plains as shown in the physiography map (Fig. 3-1). The sands and sandy loams of the Pontypool, Dundonald and Brighton soil series tend to be droughty, possess low fertility and are susceptible to wind blow-outs due to their fine texture. It is on these soils that extensive areas have been reforested with pine and other species, and farming operations are also supported.

Soils derived from unsorted glacial till can be found in the till plains, which are located for the most part along the western perimeter and in the northern segment of the Authority. The medium textured loams and sandy loams found in the till plains tend to be droughty in the late summer and have medium fertility ratings.

Soils derived from the lacustrine deposits of the Trent Embayment are much heavier in texture and consequently have internal drainage problems. Lacustrine soils can be found in a large area immediately north of Percy Reach.

4. MINERALS

The glacio-fluvial deposits in the various land forms, have created ready sources for granular material. There are numerous small gravel pits, some abandoned and others still working. However, many of these pits served only small local projects.

Large scale commercial gravel pit operations have been established along the massive fluvial deposits near the eastern flank of the Authority, in particular Oak Hills and Pancake Hill. The largest operating gravel pit is working the Lake Iroquois beach terrace about 4 miles east of Colborne. The material from this pit is crushed and sorted, then shipped out by rail.

An extensive limestone quarry operation is located at Ogden Point on Lake Ontario. A crushing plant and an elevated conveyor system operates on the site to load bulk freighters. The crushed Trenton-Black River limestone is shipped to a cement manufacturing plant.

Two small abandoned quarries are located in the north-eastern segment of the Authority.

5 SIGNIFICANT NATURAL FEATURES

Significant natural features found within the Authority, are for the most part landforms created by glacial activity. Several of these features are of such magnitude as to merit special mention.

Drumlins are numerous in the Authority, and the large drumlins situated along Highway 45 and Highway 401 are particularly prominent. The sides of these drumlins have been steepened by the wave washing action of Lake Iroquois. Many of these drumlins were of sufficient height that they actually formed islands in Lake Iroquois. In some instances the tops of these drumlins were eroded by the wave washing and eventually became truncated drumlins such as the Murray Hills, Cramahe Hills, Oak Hills and Pancake Hill.

The kame moraine in Haldimand and Cramahe townships is actually the eastern terminus of the well known Oak Ridges Interlobate Moraine.

Several eskers are located within the Authority. Small eskers generally tending from a north-easterly to south-westerly direction just west of the Town of Campbellford on County Road 35 and north-east of the Village of Stirling on County Road 8 can be readily seen from these highways. The most prominent esker is the one that originates at Marlbank and meanders in a south-westerly direction, to enter the Lower Trent Conservation Authority at Frankford and finally terminate in the vicinity of Codrington. This Marlbank-Frankford-Codrington Esker is reported to be the longest esker in Ontario, with a length of 50 miles.*

Another natural phenomenon is the large erratic boulder situated south-west of the hamlet of Glen Miller. This boulder is reported to be of granitic rock material and was transported to its present site by glacial activity. Locally the boulder is referred to as the Bleasdell Boulder.

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* Hewitt, D. G. and Karrow, P. F.; *Sand and Gravel in Southern Ontario,* Industrial Mineral Report No. 11, Ontario Department of Mines, Toronto. 1963, 24.

Section 4
LAND RESOURCES

1. SUPPLY AND GEOGRAPHICAL DISTRIBUTION OF SOILS

The parent materials for the soil types presently found within the Lower Trent Conservation Authority were greatly influenced by glacial ice and water movement during the last glacial periods.

The unsorted till materials are a consequence of the ice movements, while the lacustrine deposits are a result of the vast body of water that inundated a portion of the Authority during the Lake Iroquois stage. Furthermore, where the shallower soils are located in the north-eastern segment of the Authority, the underlying Trenton-Black River limestone formations have provided the calcareous parent material for many of the present soils.

Thus the Authority has a variety of soils derived from glacial till, glacio-fluvial outwashes or lacustrine deposits and, due to the many variations, only 13 of the predominant soil series will be described here in detail. It should be noted that the soils found within the Authority primarily belong to either one of the following Great Soils Groups: the Grey-Brown Podzolic Group or the Brown Forest Group.

With reference to geographical distribution of the various soil types the sandy-loam and sand type soils are generally found in the western and southern half of the Authority and are associated with the sand plain areas as shown on the physiography map of the Authority. The loams are related mainly to those till plain areas in the north-eastern and the northern half of the Authority. The clay type soils are associated with the clay plain that skirts the northern fringe area of Percy Reach. The more common Soil Series found within the Authority are as follows:

a. Bondhead Series

Bondhead Series soils have developed on glacial till material which is calcareous and moderately stony. External and internal drainage are considered to be good on these moderately to steeply sloping hills. In addition, deeply weathered profiles are common on the steep slopes. The soils of this series support a wide variety of crops, although careful soil management is necessary.

b. Brighton Series

The Brighton Series of soils have formed from deltaic or outwash materials and consequently the topography is normally smooth to undulating. Drainage is considered to be good to excessive, however some soil types are quite susceptible to stream gullying and erosive actions. The sand phases display a low fertility, whereas the sandy loams reveal a higher degree of fertility. While the latter soil type is suitable for general farming operations, heavy fertilization is necessary.

c. Dummer Series

The Dummer Series of soils have developed from parent materials of stony glacial till, with the topography varying from moderate to steeply sloping hills. The soils are well drained as coarseness of the soils assists internal drainage. Areas of

extensive stoniness tend to be localized. Generally the soils in this series are used as grazing lands for livestock.

d. Dundonald Series

Soils of the Dundonald Series were developed from the calcareous sands of outwash plains, in which the topography is gently to moderately sloping. The soils are well drained. However, in some instances the stonefree sandy phases are susceptible to erosion by either water or wind action. Providing the fertility of the soil is maintained by fertilizer applications, the potential for agricultural productivity can be considered adequate.

e. Elmbrook Series

Stone-free calcareous clay material provided the basis for the development of soils of the Elmbrook Series. The gently sloping topography is imperfectly drained, as the internal drainage is slow. Quite often small isolated areas of Otonabee loam are intermingled with the Elmbrook clays which are generally located immediately north of Percy Reach. The soils are mainly cultivated for hay and grain crops.

f. Farmington Series

Soils of this series are shallow and display a rather flat topography due to the underlying limestone or sandstone bedrock. The shallowness, surface stoniness, low productive capacity and the lack of adequate soil moisture in the summer months create a soil with little ability to support field crop cultivation, although low capacity pasture is an alternative. These soils make up Class 6 land, as found in the northern segments of Huntingdon Township.

g. Newcastle Series

Lacustrine materials formed the basis of the soils in the Newcastle Series and hence the topography is undulating to gently sloping. The soils are considered to be well drained and possess above average fertility. The loam phases are suitable for fruit and canned vegetable production and can be found in areas north of Highway 2 between Brighton and Smithfield.

h. Otonabee Series

Soils of this series were formed from calcareous glacial till material and can be found on the steep sides of many of the well formed drumlins. The loam phases are frequently shallower in profile on the more sloping sides. Both internal and external drainage are considered to be good and the productivity of the soil for spring grain crops can vary due to profile depths, slopes and degrees of stoniness.

i. Percy Series

Soils of the Percy Series are derivatives of fine calcareous outwash stands, and display moderately sloping topography. Both the external and the internal drainage are considered to be good, but the low fertility level requires adequate fertilizer applications to maintain productivity. The fine sandy loam phases are utilized for fruit and vegetable production with good production dependent upon suitable climatic conditions. The loam type soils are susceptible to sheet erosion.

j. Pontypool Series

Fluvio-glacial material from eskers, kames and moraines provided the parent materials for the soils of the Pontypool Series. These poorly sorted sands, gravels and boulders have created coarse soils that are difficult to utilize, being handicapped in addition by the steeply sloped and undulating hills that effect cultivation methods. Fertility levels are low due to the low organic matter content and the erosion potential of these soils may be quite high. Drainage ability of the Pontypool Series soils is quite high. Within this series the sandy loam type soils display the greater potential for agricultural productivity.

k. Smithfield Series

The Smithfield Series soils are also developed from lacustrine deposits, but these soils are heavier textured than the Newcastle loams, and hence tend to be imperfectly drained. Drainage improvements in some locations can upgrade the productivity for general farming purposes. Topography varies from level to gently undulating.

l. Tecumseth Series

Material of deltaic or outwash origin provided the parent material for the formation of soils in the Tecumseth Series. Due to the deposition process of outwash plains, the topography with these soils is usually smooth or gently undulating. imperfect drainage characteristics of outwash soils often create high water tables. Consequently tile drainage systems may be necessary to improve productivity.

m. Muck

Scattered throughout the Authority, organic deposits can be found in low wet spots or skirting the meandering streams and rivers. The most extensive area in the Lower Trent Authority can be found immediately south of Percy Reach.

2. LAND RESOURCE AREAS AND SOIL SUITABILITY

a. Agricultural Capability

The soil capability system recognizes seven classes with the first four classes (Classes 1,2,3 and 4) indicating the suitability of better arable lands for field crop cultivation. The suitability decreases as the number increases. As a result the Class 1 soils are considered to have no significant limitations for agricultural production and the Class 4 group delineates the marginal lands for crop production. Class 1 to 4 lands are also suitable for permanent pasture as well as for cultivated field crops.

In some locations where the soil and related topographical features display a variety of combinations, the combination gives way to complex classes of agricultural land capability, for example 4-6 Complex and 6-3 Complex.

Class1: Soils in this class have no significant limitations that restrict their use for field crops.

Class 1 soils are deep, moderately drained soils on relatively flat slopes. Moisture retention of the soil must be good and the regular application of fertilizer is necessary to maintain the fertility of the soil.

Table 4-1

PERCENTAGE OF SOIL TYPES PER TOWNSHIP
FOUND WITHIN THE LOWER TRENT CONSERVATION AUTHORITY *

Township	Loam	Sandy Loam	Silt Loam	Sand	Clay	Clay Loam	Muck
Alnwick	61.3	27.7	-	2.5	-	-	8.5
Brighton	34.8	30.0	10.1	11.0	1.1	-	13.0
Cramahe	12.9	56.4	-	21.9	-	-	8.8
Haldimand	16.1	66.0	-	11.0	-	-	6.9
Huntingdon	62.1	15.2	-	10.3	5.3	-	7.1
Murray	31.8	26.9	15.2	12.5	5.6	1.3	6.7
Percy	53.5	24.7	-	10.2	-	-	11.6
Rawdon	65.7	3.4	-	1.8	22.9	0.3	5.9
Seymour	62.8	22.9	-	3.7	5.3	-	5.3
Sidney	16.2	43.6	-	20.0	18.9	0.2	1.1

* Source: Northumberland and Hastings Counties Soil Maps

Class 2: Soils in this class have moderate limitations that reduce the choice of crops or require moderate conservation practices.

The soils in this class are generally considered to be deep, with a gentle, rolling topography. However, some limitations may be imposed due to lower fertility potentials or excessive water retention. This high water content can restrict working periods on the soils or alter the structure of the soil. The crop yields are medium but, by means of good cultivation measures and drainage programs, the capacity of the soils can be increased.

Class 3: Soils of this class have severe limitations that reduce the choice of crops or require special conservation practices.

Soils of this group generally display gentle rolling undulating forms of topography with a number of limitations which affect the rating of the soil. Care must be exercised to improve the fertility and the structure of the soil. Stoniness and the shallow soil cover over the bedrock also have a limiting effect on root growth.

Class 4: Soils in this class have severe limitations that restrict the choice of crops and require special conservation practices or very careful management. The class of land can be considered as the terminal point in considering lands for economic agricultural production. Some soils, if given intensive attention, may provide a reasonable crop yield. However, much of this land may be better for forestry purposes. Soils in this group are generally coarse-textured and consequently the permeability of the soil is high. In addition to the lower water holding capacity, low fertility of the soils, stoniness and the shallow depth to bedrock of these lands greatly hinder the field crop production.

Class 5, 6 and 7: Soils of these three groups are not suitable for cultivation, due mainly to degrees of stoniness or shallow depths of soil to bedrock.

Some Class 5 and 6 land could be used for grazing purposes, while Class 7 land is not suited for agricultural production and, in fact, should be diverted to other uses such as forestry, wildlife or recreation.

Class 0: (Organic soils are not placed in capability classes).

b. Forest Capability

A similar capability rating is used by the Canada Land Inventory for forestry purposes. Thus Class 1 land displays little or no limitation to the growth of commercial forest production, with Class 4 lands being the general cut-off point for basic commercial forestry operations.

The remaining three classes, 5, 6 and 7, have decreasing productivity levels, mainly due to such characteristics as shallow soil depths, low moisture retention, the subjection to active erosion forces, or poorly drained organic soils.

Most of the authority area possesses a high potential for forestry. Because of their variability, the landscapes of the authority have been classified as complexes rather than being given single capability rating.

Complexes containing a portion of Class 1 lands for forestry, characterize 6 per cent of the Authority area. The main bulk of the authority, 80 per cent, consists of landscapes exhibiting complexes of Class 2 and 3 lands. Marginal

lands for forestry occupy only 9.7 per cent of the Authority area. The main townships possessing marginal forestry lands are Huntingdon, Rawdon, Sidney, Murray and Brighton, Murray Marshes being the main factor in Brighton and Murray townships.

Practically all lands fall in some degree below the optimum for tree growth. Within the authority the limitations or restrictions to forest growth can be ranked in order of importance:

1. Physical restriction to rooting, caused by dense or consolidated layers, other than bedrock (33.5 per cent of the Authority area).
2. Soil moisture deficiency (23.9 per cent).
3. Excessive levels of calcium (15.1 per cent).
4. Excess soil moisture (14.7 per cent).
5. Restriction of rooting zone by bedrock (7.9 per cent).

The remaining forest growth restrictions in the Authority are low fertility and a combination of excess soil moisture and moisture deficiency. These are influences on 4.9 percent of the Authority area.

3. NATURAL VEGETATION

Within the Authority area, the descriptions of major site regions and their associated forest cover, used by Rowe* and Hills+, are similar. Under Hills' system, the Authority area lies in the Lake Simcoe--Rideau Site region and the Lakes Erie — Ontario site region, with the boundary between the two regions being the southern base generally of the Oak Ridges Kame Moraine. A characteristic of the vegetative cover of the Authority, therefore, is that the most southerly site region contains species common to the Deciduous Forest Region found mainly in the United States.

The forest communities of the southern portion of the Authority, adjacent to to Lake Ontario, are dominated by broad-leaved trees. These are primarily beech, sugar maple, basswood, red maple, red oak, white oak, shagbark hickory, bitternut hickory, silver maple and butternut. The conifers represented are usually hemlock, white pine, red cedar, and white cedar.

Other species common in the Authority are white and black ash, bur oak, yellow birch, black cherry, blue beech, trembling and largetooth aspen, red pine and balsam fir.

During the 1969 survey, a number of less common tree species were identified. These were black maple, black oak, and eastern cottonwood.

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* J. S. Rowe — *Forest Regions of Canada:* Canada Dept. of Northern Affairs and National Resources, Forestry Branch - Bulletin 123.

\+ G. A. Hills — *A Ready Reference to the Description of the Land of Ontario and its Productivity:* L Div. of Research, Ontario Dept. of Lands and Forests.

A Study of the Local Distribution of Red Cedar

This study was an attempt to gain greater insight into the effect of the spread of red cedar, since the Authority is a natural adjunct to the Prince Edward Region Conservation Authority, where the acreage covered, sometimes almost exclusively by this species, does represent a conservation problem. It is however, recognized that the occupation of some lands by this species is not entirely detrimental, as it is able to survive and grow under conditions that can support very few other forms of vegetation, particularly trees. Red cedar is, therefore, at least a form of shelter and a natural means of rehabilitating land that has undergone a long period of agricultural pressure, and conceivably should not have been cleared at settlement.

Generally the spread of the species has been from the main valley of the Trent River outward. Stands are denser and individual trees larger in this main valley area.

Beyond the valley of the Trent River, red cedar has exhibited an affinity for hillsides in the local drumlin fields. Associate species are nearly always present but these tend to be those species found in dry scrublands. Pastures are also invaded.

Spread, which is usually assisted by birds, can emanate from fences, hedgerows, roadsides and even private gardens, where it was also observed with some frequency in 1969. Locally red cedar is also found on the fringes of woodlots and some wet scrub areas.

Red cedar is locally slow growing and easily controlled in its initial invasion stages, by using standard arm implements. The presence of scattered specimens on hillsides is also an indicator of land which has been generally abandoned by agricultural effort. Hence, it represents a potential site for tree planting.

State of Forests and Woodlots

Influences on the local forest cover based on human action began shortly after the American Revolution. Forest land was first cleared for agriculture with settlers using forest products directly for building, fuel, fencing, household utensils and implements. Cutting of the finest white pine also occurred for the masting requirements of the Royal Navy. Later the square timber trade grew, followed by early lumber production by pit-saw mills, then waterpower mills and finally motor-powered sawmills. Local rail developments increased this production after 1854.

A component of young white pine is still to be found in the Authority, some of which is of good quality, but while pine is still being cut, there is now a far heavier concentration on hardwood cutting. The portable sawmill is a major influence on local woodlands at the present time.

Further modifications are variable, depending on the locality. Hence grazing of woodlots has had a marked effect in the past, creating areas of heavy ironwood regeneration, and substory layers. More recently grazing has decreased, particularly in tobacco and orchard areas. It is in these that the changes in farming systems out of livestock production have allowed forest regeneration to commence natural stand replenishment.

Land abandonment due to poor agricultural prospects is generally more common in the north-eastern segment of the Authority. Reinvasion by various shrub cover species is becoming a major influence on lands returning naturally to forest cover. Red cedar invasions have also occurred within a specific previously described range. Reforestation, particularly of morainic lands, has represented a major landscape influence in the Authority area, beginning with the establishment of the Northumberland and Durham County Forest in 1924. There are approximately 3100 acres of this forest within the Authority. Private reforestation has become substantial both in plantations established for Christmas tree production and in long term plantations.

4. USE AND MANAGEMENT

a. *Agriculture*

Because of the variations in soil types, in agricultural land capabilities and topography, different types of farming operations have evolved within the Authority. However, in some instances the farm productivity has been satisfactory in spite of the deficiencies in the soil or topography due to improved farm practices. In other situations, the past and present management practices have actually decreased the potential productivity of the soils on a particular farm.

The glacial parent materials of some of the soils have contributed such limiting factors as low fertility ratings, stoniness and drainage problems which eventually influence the productivity of the soils. The rolling or undulating topography, which is common to many parts of the Authority, can hamper proper field cultivation procedures that are aimed at controlling soil erosion problems. The steep slopes of some fields, in conjunction with the high erosibility of soils on these hilly slopes, should be considered by farm operators in terms of soil erosion prevention, particularly where a high degree of cultivation is required in producing a crop.

The following list indicates types of soils and associated farming operations that are carried out in various parts of the Authority:

i. The sandy loam soils found in Haldimand and Cramahe townships are presently used for tobacco production and, due to extensive cultivation requirements, significant soil erosion problems have occurred on the sloping fields.

ii. The better drainage abilities of the Bondhead and Newcastle loams have been utilized for tree-fruit production along the bench terraces found in Brighton and Murray townships.

iii. The rolling topography with its associated Otonabee loams tends to support mixed livestock operations in Percy and Alnwick townships.

iv. In the south and south-eastern portions of Seymour and Rawdon townships, large areas of Otonabee loams are present, and significant areas of Elmbrook clay are prevalent in the latter township. These soil types generally support dairying and mixed livestock operations, but tiling may be required to remedy the imperfect drainage characteristics of the Elmbrook soils.

b. *Scrublands*

Scrublands are areas covered with woody shrubs and low growing non-commercial tree species. These can be divided into two types, dry scrub and wet

Limestone quarry in operation adjacent to Lake Ontario shoreline.

Unmaintained pastureland is susceptible to red cedar invasion in the eastern segment of the Authority.

scrub. Dry scrublands commonly contain species such as wild apples, hawthorn, sumac and prickly ash. The latter is abundant in the north-eastern section of the Authority.

Wet scrublands commonly contain low-growing willow species and dogwoods.

Combined, these areas are a major land management problem in the Authority, representing in total a return of 21.8 per cent of the present cleared land to natural forms of cover through re-invasion. The problem is most serious in Brighton, Huntingdon, Sidney and Rawdon townships. Replacement of these scrub-land species through reforestation is best considered for areas in Huntingdon and the northern part of Rawdon and Seymour townships those areas where agriculture has less potential.

Elsewhere, particularly on the morainic area on either side of Highway 401, the presence of consolidated masses of sumac indicates a potential for winter bird feeding. The forestation of adjacent clearings designed eventually to shelter useful sumac patches, is a feasible measure where landowners wish to provide winter shelter for birds.

Table 4-2

PERCENTAGE OF AGRICULTURAL LAND CAPABILITY CLASSES PER TOWNSHIP FOUND WITHIN THE LOWER TRENT CONSERVATION AUTHORITY *

Township	Classes (1,2,3)	Class 4	Class 5	Class 6	4-6 Complex	6-3 Complex	Class 7	Organic Soils
Alnwick	59.0	-	8.5	-	16.0	4.0	1.3	11.2
Brighton	57.4	0.2	10.8	0.1	13.1	3.8	1.1	13.5
Cramahe	65.8	-	7.8	-	15.3	0.2	1.5	9.4
Haldimand	45.1	2.5	9.1	-	36.9	0.5	0.7	5.2
Huntingdon	30.5	2.8	1.4	51.0	-	6.1	-	8.2
Murray	67.0	0.3	6.6	4.7	9.3	0.1	1.3	10.7
Percy	70.8	-	6.8	0.5	7.9	3.1	0.4	10.5
Rawdon	61.6	-	9.2	20.0	-	5.7	-	3.5
Seymour	73.1	1.0	8.9	6.0	2.8	1.4	1.3	5.5
Sidney	63.7	14.7	7.4	7.0	0.3	3.5	2.9	0.5

* Source: Agricultural Land Capability Maps - Canada Land Inventory

In other parts of the Authority, the treatment of scrublands should be a matter of studying each individual case on its own merits. It should be remembered that some areas of wet scrubland are simply poorly drained former agricultural fields that could be improved with tile drainage if suitable outlet sites are available. Such areas may also represent good sites for conservation ponds.

c. Wooded Pastures

Although a previous section suggested that woodlot grazing has decreased, heavy grazing has destroyed many woodlots in the past. The remnants of these overgrazed stands were observed in the areas surveyed in 1969 on significant acreages. These have been described as wooded pastures, wherein an unimproved pasture condition is to be found in a woodland composed of a few open-grown trees. The conversion to this condition has occurred over a period of many years of constant grazing pressure.

Such losses represent up to a third of the woodland in some townships.

This is a sufficiently significant acreage that a decision should be made now by individual landowners to either improve these areas as permanent pastures, if the land possesses the capability, or to forest and protect them.

Section 5
WATER RESOURCES

1. CHARACTERISTICS OF THE DRAINAGE SYSTEM

The Lower Trent Region Conservation Authority comprises an area of 795 square miles. The headwaters area of the Trent River, the major river system draining the regions, is located in Haliburton County about 100 miles north-west of the point where the Trent River empties into the Bay of Quinte and well beyond the boundaries of the Authority. The Trent River serves as part of the Trent Canal system, a short-cut route for smaller vessels between Lake Ontario and Georgian Bay.

The Trent River enters the Authority in an easterly course forming with Rice Lake, the north-westerly boundary of the Authority. The Trent River and Canal descend a total of about 367 feet in its 57 mile journey from Rice Lake to the Bay of Quinte at Trenton requiring 18 locks on the canal.

For ten miles below its confluence with the Crowe River, the Trent divides the northern half of the Authority, with tributary streams in this area flowing to the Trent in north-easterly courses from the west of the Trent and in south-westerly courses from the east of the Trent. Average stream gradients are in the order of 20 feet per mile for these tributaries. Drainage areas for the larger tributaries and average stream gradients are summarized in Table 5-1.

The Trent then swings in a 12-mile easterly course before turning southward to the Bay of Quinte. In its southerly course the Trent flows roughly parellel to and about one to two miles from the Authority's eastern boundary. Tributary streams from the west flow to the Trent in north-easterly courses, with stream gradients averaging about 20 feet per mile. Cold Creek is the major tributary stream.

The south-western portion of the Authority is drained by a series of small streams flowing in a southerly direction and discharging into Lake Ontario. These streams have higher stream gradients than the streams which empty into the Trent in the order of 50 feet per mile as noted in Table 5-1. Shelter Valley Creek is the largest of these streams discharging into Lake Ontario.

In addition to the Trent Canal, the Murray Canal is also within the Authority region. The Murray Canal does not have any locks, and provides a 7.5-mile water link between the western end of the Bay of Quinte and Presqu'ile Bay.

2. WATER YIELD

Unfortunately there are no long-term streamflow records available for streams in the Lower Trent Region. However, records for the Trent River at Healey Falls compiled since 1911 indicate that the mean annual runoff at this location is equivalent to 11.85 inches of water over the whole area. Ninety per cent of the time, the yearly runoff has been between 7.96 inches and 16.74 inches. These figures are indicative of the runoff from the area to the north of the Authority.

For comparison, on the Ganaraska River at Dale to the west of the Authority the mean yearly runoff compiled from 17 years of streamflow records is 16.74 inches. Ninety per cent of the time the mean yearly runoff has been in the range from 10.99 inches to 22.49 inches at this location.

Evaporation losses are much greater for the Upper Trent area due to the presence of numerous inland lakes. This factor is considered to account for the differences in water yield between the Trent and the Ganaraska. Therefore, for streams having little or no surface water storage in the Lower Trent, water yield should closely approximate the values for the Ganaraska. In no instance should the yield be less than the values for the Trent River at Healey Falls.

3. GEOGRAPHIC AND SEASONAL DISTRIBUTION

The major surface water source in the Lower Trent Region is the Trent River and Canal. These surface water features and other surface water resources of the Lower Trent Region are illustrated in Figure 5-1.

The majority of the region's small natural lakes are located in Percy township in the north-west section of the region. There are also a number of small ponds scattered throughout the region located on the many streams.

The highest average flows usually occur in early spring—either March or April. Low flows usually occur in late summer—in August and September—but it is not unusual for low flows to occur in any month from May to February. There are a number of dams in the region but the reservoirs created by these dams are relatively small and hence their effect on stream flows is considered negligible. This is in contrast to the Trent Canal system, where the dams and locks are regulated for navigation and power generation purposes. The objective is to maintain water levels at near constant levels for navigation and recreation purposes during the summer months. Any sudden inflow or excess runoff is discharged through spillways incorporated in the dams and locks or is alternatively discharged through electric power generating stations along the system.

4. GROUND WATER

Ground water is the major source of water supply for the Lower Trent region. Table 5-2 lists the municipal water consumption and source of supply for the urban areas.

In the rural areas either drilled wells or dug wells provide the means of obtaining water for domestic and agricultural uses. A sample of 74 residences revealed that 12 had drilled wells and 62 had dug wells. Of the 62 dug wells, 11 were reported to have gone dry during drought periods. Although the sample selected was quite small, it indicates that the drilled well is the most satisfactory method for obtaining water. However, reference should be made to Ground Water Bulletins, published by the Ontario Water Resources Commission for additional data on specific areas.

5. WATER QUALITY FACTORS

The water quality of streams in the Lower Trent Region is acceptable for agricultural uses such as stock watering and irrigation. Sedimentation is evident in a number of the small reservoirs presently not being maintained and to a lesser extent in reservoirs that are being maintained. Eroded material has a detrimental effect on water quality particularly during the spring runoff. At this time, large areas of land are free of vegetative cover and, with the high velocity and volume of runoff soil particles are easily transported to the streams. This problem is most prevalent in the rural areas.

Water quality is also detrimentally affected in the rural areas by the runoff from road areas where liquid wastes are used for dust control purposes. Silting

Cold Creek at Frankford, major tributary of the Trent River in the Lower Trent Authority.

Small pond north-west of Colborne one of several small ponds within Lower Trent Region.

Dartford pond situated in Percy Township, south of Hastings.

of stream waters occurs where livestock watering is not confined to specific, properly gravelled areas.

Water quality in urban areas is, in general, quite good. Exceptions occur where raw or untreated domestic and industrial wastes are permitted to enter a stream or water course.

Water quality in the Trent River is affected by eutrophication or fertilization from major population centres along the river and from the many pleasure boats and cottages in the Upper Trent area. Smaller communities also contribute either to eutrophication or degradation of the water or both. These factors as well as sedimentation and agricultural pollution are discussed in later sections of the report.

6. WATER USE AND MANAGEMENT

Navigation is given first priority in the Trent Canal system and is primarily recreational. The Trent Canal is operated and maintained by the Canal Services Branch of the Canada Department of Transport. This Branch maintains a number of dams within the canal system which store water during the spring runoff period for use throughout summer months.

Table 5-1

STREAM GRADIENTS AND DRAINAGE AREAS

Stream	Drainage Area Square Miles	Length Miles	Average Gradient of Stream ft/mi	Discharges Into
Squire Creek	74.1	12.9	16.8	Trent River
Rawdon Creek	67.6	20.0	10.2	Trent River
Salt Creek	35.7	14.6	25.9	Trent River
Percy Creek	93.6	22.5	20.0	Trent River
Cold Creek	99.3	28.6	14.0	Trent River
Mayhew Creek	13.8	6.7	39.6	Trent River
Trout Creek	16.3	7.85	31.3	Trent River
Mill Creek	36.0	16.1	26.4	Percy Creek
Smithfield Creek	7.0	6.60	49.8	Lake Ontario
Salem Creek	2.7	3.57	36.1	Lake Ontario
Butler Creek	9.3	6.32	65.5	Lake Ontario
Lakeport Creek	16.9	5.2	63.3	Lake Ontario
Shelter Valley Creek	26.6	11.0	52.6	Lake Ontario

This provides additional benefits such as relief from flooding during periods of high water and sustained flows which enhance the recreational use of the river and provide a reliable flow for the generation of electrical power.

Other water management programs are carried out to a lesser extent by private mill owners who still use water power to operate grist mills and sawmills.

Table 5-2

MUNICIPAL WATER CONSUMPTION AND SOURCE OF SUPPLY

Municipality	Consumption * Gallons per day	Source of Supply
Towns		
Campbellford	500,000	Trent River
Trenton	3,250,000	Ground water & Trent River
Villages		
Brighton	600,000	Ground Water
Colborne	125,000	Ground Water
Frankford	50,000 winter 200,000 summer	Ground Water
Hastings	71,000	Trent River
Stirling	107,300	Ground Water
Townships		
Percy	34,000	Mill Creek

* 1966-1967 "Water and Pollution Control" - Pollution Control Manual and Directory, 1967, and OWRC Records

- LEGEND -
HYDROLOGIC GAUGES
EXISTING
PRECIPITATION
STREAM FLOW
SNOW COURSE
TOWNSHIP BOUNDARY
INTERNAL WATERSHED BOUNDARY
LOCK
EXISTING DAM
RECOMMENDED FLOOD PLAIN ZONING
SURFACE WATER RESOURCES

SURFACE WATER RESOURCES

Section 6

FISH AND WILDLIFE RESOURCES

1. FISH

a. Inventory

The only commercial fishing in the waters of this Region is that for carp which have been caught in Rice Lake since 1964, and, more recently, for "panfish," also in Rice Lake. The catches of carp each year are given in the Appendix. The game fish present include the following species:

brown trout	smallmouth bass
brook trout	largemouth bass
northern pike	pickerel (walleye)
muskellunge	

The full list of fish of the Region is given in the Appendix.

b. Habitat Conditions

There is a great variety in the habitat conditions for fish in the Region. These vary from the eutrophic (enriched) conditions in Rice Lake and parts of the Trent River, in which muskellunge, bass and walleyes live, to the clear cold streams which are suitable for brook trout. These mostly flow between the many small steep-sided hills (drumlins) of the Region. There does not appear to be any sound reason for the introduction of additional fish species, with the possible exception of rainbow trout. Brook trout plantings may be justified particularly for put-and-take fishing in some streams.

Stream Surveys

Since the maximum stream temperature in summer appears to be the controlling factor in the distribution of trout in this Region, this factor was the chief one deduced in the streams, which were examined at about 140 points during the summer. The methods used are described in the Appendix of this Report.

The results of the stream surveys are shown in detail on the accompanying map, "Biological Conditions of Streams."

Rice Lake

Rice Lake, apart from the drumlin hills which lie in it, is a shallow saucer-shaped lake with an area of 23,000 acres and has a comparatively level bottom. It still provides much recreational angling and a very considerable commercial crop. The chief commercial fish are carp, for which there is a large market in Toronto. It is thought that some of the carp also reach the New York market. The actual crop of carp since commercial fishing was permitted may be found in Volume II of this report. Panfish, which grow to exceptional sizes in this lake, are also harvested commercially.

The most prized fish in the lake is, of course, the muskellunge. An average of 65 of these fish per annum are brought into one of the fishing camps on the lake. Based on 652 of them caught and weighed between 1957 and 1967, 80 per

cent of the muskellunge fell into the weight classes from five to nine pounds. Very few of the fish weighed more than ten pounds.

The muskellunge, in spite of its exception qualities as a fighting fish, is not the most important sport fish in the lake. While for many people the objective is to catch any fish of any species, the predominant species of game fish now in the lake are pickerel (walleye) and largemouth bass.

Creel censuses of the fishing have been carried on for some time but, while the methods of collecting data have remained the same, the method of analysis of the data has changed radically, and it does not appear that the 1969 data (which have been analysed with sophisticated techniques) should be compared with older findings.

In 1969 smallmouth bass and muskellunge were excluded from the creel census data, because the census is carried out from mid-morning to mid-afternoon and both of the above species are caught mainly early in the morning and late in the evening and apparently are present in much smaller numbers than pickerel and largemouth bass.

Between May 10 and August 31, 1969, a creel census of the above two species was carried out. The percentages of these two species in the total catch were as 92.8 per cent pickerel and 7.2 per cent largemouth bass. It is obvious therefore, that at the present time pickerel (walleye) are by far the most important species cf game fish in the lake. The total number of game fish taken during the season was calculated by two different methods. The results were in close agreement, (23,894 and 22,070) differing only by 8.3 per cent. It is interesting that since the lake has an acreage of approximately 23,000 acres the catch is about one fish per acre, but it must be remembered that large parts of the lake are covered with weeds or algae during the summer and these areas would probably not be fished except by some people for muskellunge.

The former conditions of Rice Lake are described in the Appendix.

2. WILDLIFE

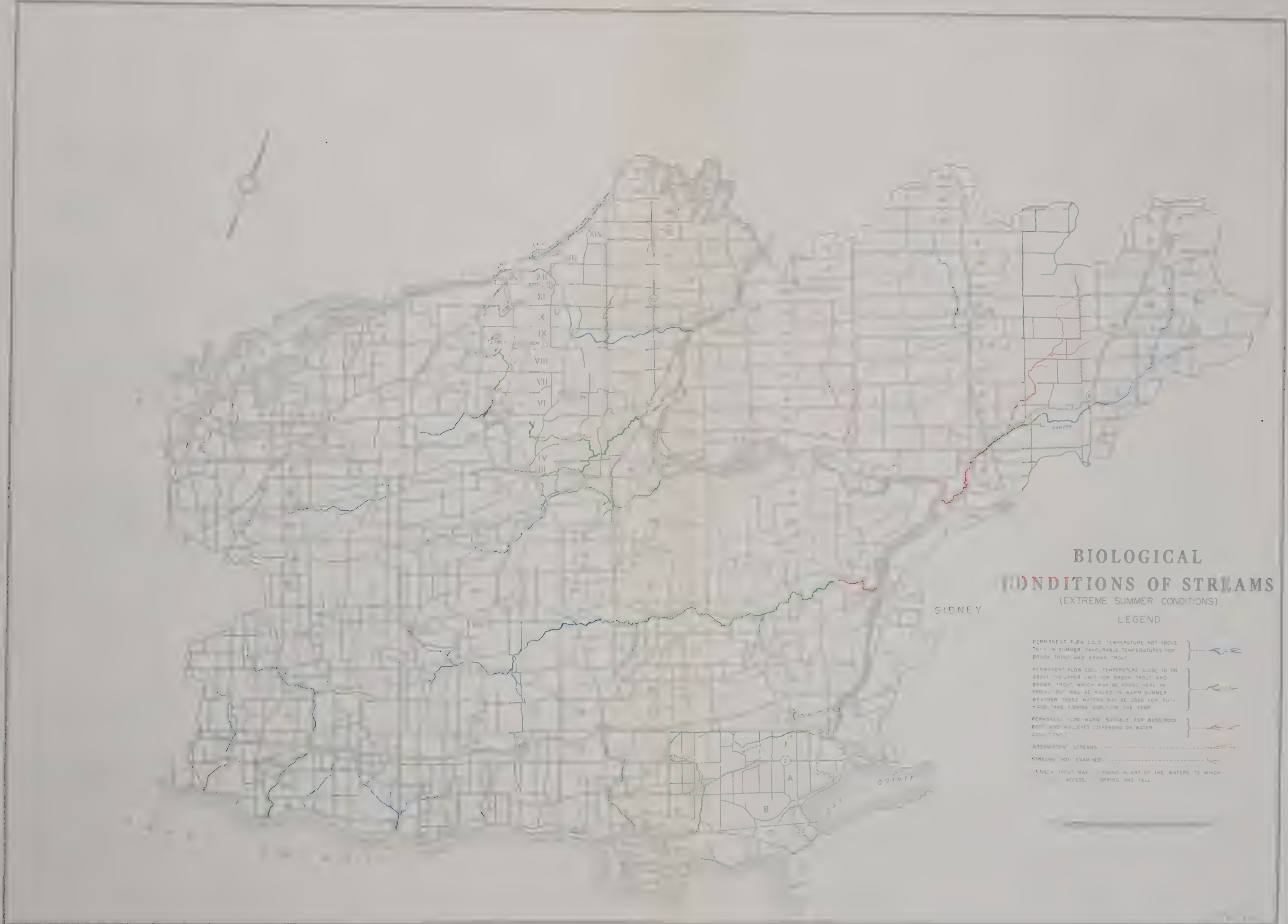
a. *Habitat Conditions*

There are probably more different types of habitat for wildlife in the Region than in any area of comparable size in Ontario. A few examples of the more outstanding habitats are given here. The Rice Lake marshes and those along the Trent River below Rice Lake have long been attractive to waterfowl hunters. Likewise the area along the Lake Ontario shore from Presqu'ile Bay to Young Cove is well known to waterfowl hunters, although this area is now somewhat overgrown with cattails. The rest of the Lake Ontario shore is a relatively sterile beach, except the west shore of Prequ'ile Provincial Park, which is extremely attractive to shore birds in migration, and its eastern shore which has good habitat for waterfowl. The Park has long been of great interest to field naturalists.

The area in the north-east part of the Region, centred on Rawdon and Huntingdon townships, has generally shallow and poor soils over limestone and should tend to be poor habitat for wildlife. However, as there are many relatively poor farms with much land either abandoned or uncultivated, a good variety of brushy cover has grown up, with many wetlands resulting mostly from beaver dams, and the land actually provides much habitat for deer, rabbits and grouse.

The stream surveys in 1969 included the checking of all streams for fish with nylon minnow seines. This stream feeds a pond on which more than 60 wildfowl were seen, near provincial Highway 45.

Stream surveys also included the use of a square foot bottom sampler, from which the insects collected are here transferred to vials, and later identified as to species. The bottom insects are excellent indicators of the water quality and maximum summer temperatures.


BIOLOGICAL
ONDITIONS OF STREAMS
(EXTREME SUMMER CONDITIONS)
LEGEND
PERMANENT FLOW COLD TEMPERATURE NOT ABOVE 75° F IN SUMMER FAVOURABLE TEMPERATURES FOR BROOK TROUT AND BROWN TROUT
PERMANENT FLOW COOL TEMPERATURE CLOSE TO OR ABOVE THE UPPER LIMIT FOR BROOK TROUT AND BROWN TROUT, WHICH MAY BE FOUND HERE IN SPRING BUT WILL BE KILLED IN WARM SUMMER WEATHER THESE WATERS MAY BE USED FOR PUT-AND TAKE FISHING EARLY IN THE YEAR
PERMANENT FLOW WARM SUITABLE FOR BASS, ROCK BASS AND WALLEYES (DEPENDING ON WATER CONDITIONS)
INTERMITTENT STREAMS
STREAMS NOT EXAMINED
SIDNEY
QUINTE
RAWDON
XIV
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XI
X
IX
VIII
VII
VI
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II
A
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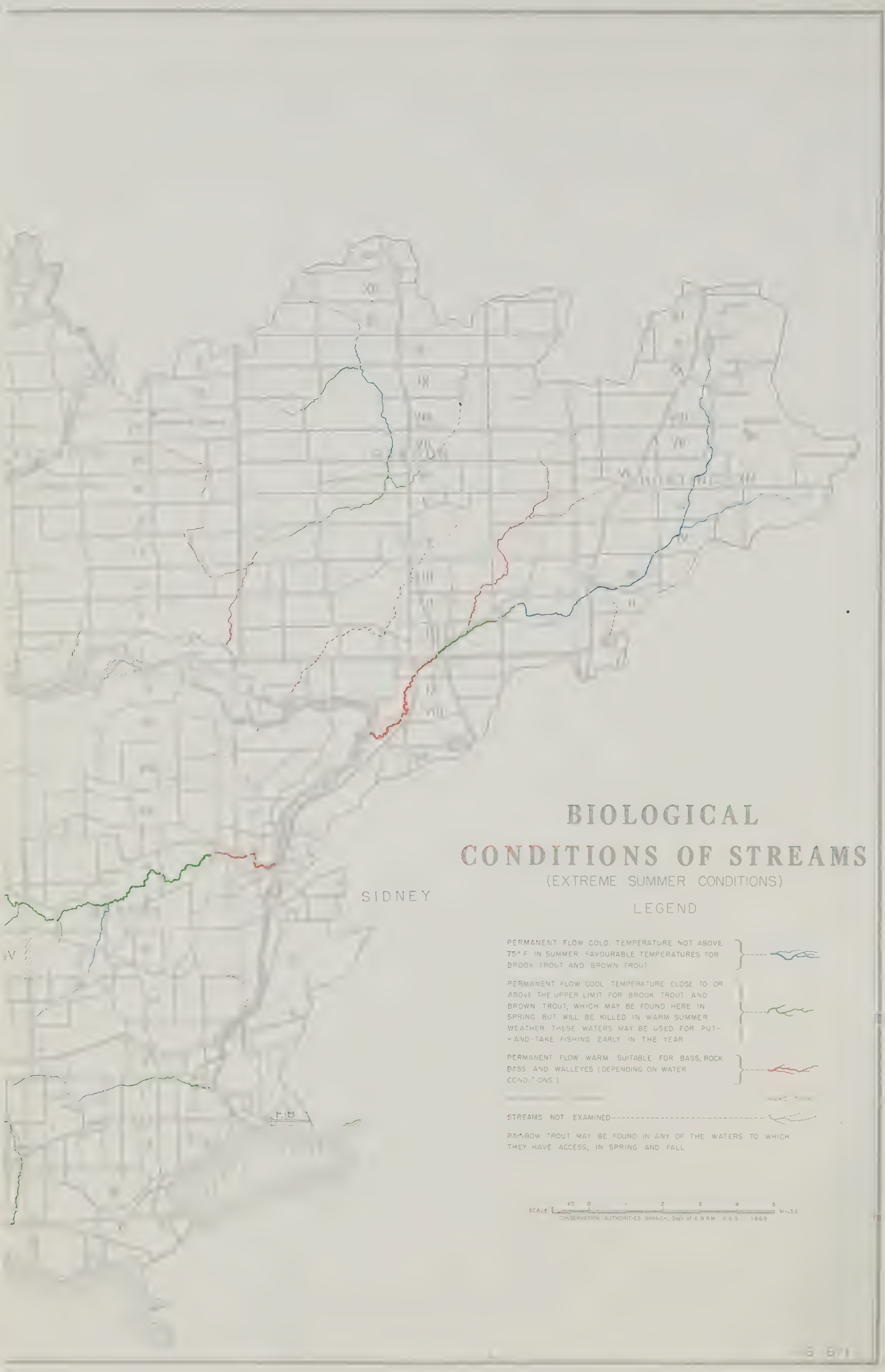

BIOLOGICAL
CONDITIONS OF STREAMS
(EXTREME SUMMER CONDITIONS)
LEGEND
PERMANENT FLOW COLD. TEMPERATURE NOT ABOVE 75° F IN SUMMER FAVOURABLE TEMPERATURES FOR BROOK TROUT AND BROWN TROUT
PERMANENT FLOW COOL TEMPERATURE CLOSE TO OR ABOVE THE UPPER LIMIT FOR BROOK TROUT AND BROWN TROUT, WHICH MAY BE FOUND HERE IN SPRING BUT WILL BE KILLED IN WARM SUMMER WEATHER. THESE WATERS MAY BE USED FOR PUT-AND-TAKE FISHING EARLY IN THE YEAR
PERMANENT FLOW WARM SUITABLE FOR BASS, ROCK BASS AND WALLEYES (DEPENDING ON WATER CONDITIONS)
STREAMS NOT EXAMINED
RAINBOW TROUT MAY BE FOUND IN ANY OF THE WATERS TO WHICH THEY HAVE ACCESS, IN SPRING AND FALL
SCALE
1/2 0 1 2 3 4 5 MILES
CONSERVATION AUTHORITIES BRANCH, Dep't of E & R M G G G 1969
SIDNEY

The Northumberland County Forest on the moraine in the centre of Northumberland County tends to be sterile in the dense stands of coniferous trees, but along the edges deer and other wildlife thrive. The Cold Creek valley winds from west to east and is wide in some sections, with occasional constrictions. The general mass of the Region consist of narrow valleys between large numbers of rounded hills or drumlins. The steeper sides of these drumlins are often wooded and provide good wildlife cover.

The chief remaining area of special potential for wildlife is the Murray Marsh. The Department of Lands and Forests already has a comprehensive plan for the development of about 10,000 acres of high capacity wildlife and recreational lands. This development is discussed in a later section. There are about 6,000 acres of marsh in this area.

At present, large numbers of pheasants are introduced into the Brighton Public Hunting Area from the Codrington Rearing Station which is operated in conjunction with the Codrington Trout Hatchery. Some of these pheasants are apparently breeding in the Brighton Hunting Area.

There does not appear to be any good reason to introduce other game species at the present time. However, there may come a time when the population of Hungarian Partridges in eastern Ontario will have increased sufficiently to allow this particularly hardy race of partridge to be introduced in the Region. This should be considered only as part of a very long term plan.

b. Deer

While deer are relatively common in the Region, and large numbers of deer deer tracks were seen by the field party, there appears to be a concentration of them between Presqu'ile Provincial Park and the wooded hills in the vicinity of Orland. There is some evidence (from a conservation officer) that many deer spend the summer in the Cold Creek area and winter in Presqu'ile Park. Some deer are killed in spring and fall on Highway 401 just west of Provincial Highway 30. There is a resident herd of deer in the park and also considerable deer hunting carried out on Wilson Island in the Trent River. The largest number of deer seen at one time was five — one buck and four does — seen grazing in the undergrowth on the edge of the Northumberland County Forest. The County Forest itself is relatively sterile as far as wildlife is concerned.

c. Ratings for Wildlife Under the Canada Land Inventory

The Lower Trent Region has already been surveyed for its wildlife potential as a part of the Canada Land Inventory, which is the basic data-gathering arm of the Agricultural Rehabilitation and Development Act (ARDA). The actual work, which is largely federally-sponsored, was carried out by the Ontario Department of Lands and Forests. The species primarily involved here included Ruffed Grouse and the European hare (jackrabbit). The land capability was based on the inherent ability of land or water to produce food and cover, but the effects of climate were also considered. The land capability rating for wildlife did not include present land use. The ratings indicate levels of game populations and production possible only when the land or water is providing good quality habitat. By eliminating the effects of present land use, comparisons between various land uses may be made, and plans developed to put the land to its best use.

For all of the species of wildlife, a seven-class scale was used to indicate the capability for wildlife, the areas of highest capability being rated class 1 and the lowest class 7.

The "degree of effort" required to transform an area into its best capability for wildlife was also rated in five classes, varying from class A, where little or no habitat manipulation is needed, to class E, where extensive and intensive manipulation would be needed to realize the full potential.

The land units mapped were normally not less than four square miles, which allows an area large enough to support self-sustaining populations of most species of wildlife, but sub-units such as marshes and bogs which could be suitable for ducks and geese were mapped of a size as small as 25 acres.

The limitations which affect productivity of any area were also mapped, as were compensations. An example of a limitation would be poor drainage which might be overcome for farmland species by good agricultural management, when the limitation would then cease to exist.

A typical example of a compensation is good interspersion of land types, providing the useful "edge effect" which most wildlife need. This is a particular feature in almost all parts of the Lower Trent Region, with the exception of the Murray Marsh alongside Percy Reach, which, apart from the drumlins in it, is a rather uniform marsh.

For Ruffed Grouse production capability, the area south of the Trent River and centred on the settlements of Brickley and Godolphin is rated Class 2, the area south of Cramahe Hill centred on Orland is rated Class 4, and most of the rest of the Region is rated as Class 3. For European hares almost all of the central section of the Region from east to west is rated Class 4 and the remainder of the Region is Class 3.

The Murray Marsh

The following description of the Murray Marsh and its potential is abstracted from an excellent report prepared by E.T. Cox of the Department of Lands and Forests wildlife staff at the Lindsay District office.

The marsh is a unique complex of 72 drumlins or sand islands set in a former bay, now largely swamp-filled. Sphagnum moss is a common component of the ground vegetation in many areas.

The marsh, so far as wildlife habitat is concerned, consists, apart from the many drumlins in it, of three areas. These include the following:

Outlying Marsh: The south shore of Percy Reach contains 850 acres of floating marsh, much of it cattails.

First Swamp: An extensive area, 3,700 acres of shrub and tree swamp, starts at the edge of the outlying marsh and spreads inland up to two miles at the most. This is separated from the second swamp by three drumlin islands which are

joined by a corduroy road running from the mainland on each side.

Second Swamp: Some 2,000 acres of additional shrub and tree swamp stretch south of the corduroy road, and part of this portion is as much as four miles inland from Percy Reach.

The whole marsh is flooded to a depth of two to four feet in spring and occasionally in the fall. Borings made in 1964 in the summer, invariably showed the water level to be within two feet of the surface.

While there are several channels through the marsh and a few pools, its wildlife production was low in 1969, and had been low for several years in relation to the great size of the marsh. The following is abstracted from the Lands and Forests report.

Hunting

On opening day as many as 200 waterfowl hunters are active in the Percy Reach-Murray Marsh area. Waterfowl hunting is generally confined to the marshes in and bordering Percy Reach (about 1,000 acres) although geese have been shot on the central islands (Ames and Austen islands). An average morning in the early part of the season will find 75 hunters out. The 10 to 12 permanent blinds in the area do not indicate the number of hunters since most hunters prefer to trample down a small section of the dense cattail to form a natural blind. Decoys are used by hunters in the area known as the "Blue Hole" (Lots 15 and 16, Concession X, Murray Township). A small number of geese are shot in this area each year.

During the usual three-day deer season an estimated 20 deer are shot on the surrounding uplands and islands. Jack-lighting for deer has been a problem on the central islands. These poachers prefer to walk in by way of the road from the mainland to Ames or Cole Island.

On Saturday during the open season it is possible to check 20 small game hunters on the swamp road. Considerable hunting for European hares, snowshoe hares, cotton-tail rabbits and Ruffed Grouse is done on the central islands and surrounding uplands.

Hunting is limited to an area of about 2,000 acres. In recent years, the practice of posting property started and grew to the point where Austen Island and the entire frontage on the reach was posted.

Trapping

It is believed that the four original owners of the property along the south shore of the Reach obtained their patents from the Crown in the 1930s. They used this land mainly for trapping, each taking an estimated 1,000 to 1,500 muskrats annually. By 1953 these men were, mainly due to their age, no longer actively trapping.

Following that period three Indians from the Alderville Reserve trapped most of the area. By 1963 the number of Indians trapping had increased to six.

Approximately 40 mink are trapped annually. Muskrat and beaver catches from the area are totalled below:

	Muskrat	Beaver
1969	(est.) 1,535	not known
1968	1,186	not known
1964-5	2,100	39
1963-4	1,919	44
1962-3	2,210	31
1961-2	1,991	28
1960-1	1,810	20

The low figures for muskrats in 1968 and 1969 may be due to the reduced value of muskrat pelts.

The Indians trap only the edges of the marsh, an estimated 800 acres. They were extremely pleased with the Crown purchases of land in 1963 and 1964. Prior to these purchases they had experienced considerable difficulty in obtaining access.

Over the years local trappers have complained a great deal about the fluctuation of water levels in Percy Reach. Some burning of cattails is done each year.

Wildlife Observation

For some reason or other birds and mammals interest the general public more than reptiles and other forms of life. The birds and mammals of the region are therefore discussed in this section while the other interesting species are included in the Appendix.

Game Birds

The game birds in the South Trent Region include the Ringnecked Pheasant, Ruffed Grouse (or Partridge), Woodcock and Snipe, besides a large variety of waterfowl. There are no other birds which may be legally shot in Ontario except the Hungarian Partridge, two other species of grouse, the Ptarmigan and the Bobwhite Quail, none of which are found in the Region, and crows, cowbirds, blackbirds, starlings and house-sparrows.

List of Birds

Two lists are available of the birds of this Region. One of these is the Presqu'ile Provincial Park list. This is an excellent list based chiefly on the accurate observations of R. Scovell when he was the Park Naturalist for this area. The second list is one describing the birds of Murray Marsh, south of Percy Reach on the Trent River. This second list is not based on adequate observation at all seasons of the year. Many additional records (listed below) are available from the Department's summer survey of 1969.

The naming and order in the table follow those of the official American Ornothologist's Union check list of 1967:

Table 6-1

BIRDS OF THE LOWER TRENT REGION

Note: The meanings of the symbols noted in the "status" column are as follows:

I	Introduced	W	Winter Visitor
N	Nests in the Region	SU	Summer visitor, possibly nesting
S	Spring Migrant		

F	Fall Migrant	R	Permanent Resident
SF	Spring and Fall Migrant	RAN	A rare species nesting in the Region
SFW	Spring, Fall and Winter Visitor	RA	Rare visitor

Status	Species
N	Common Loon
RA	Red-throated Loon
SF	Red-necked Grebe
SF	Horned Grebe
RA	Western Grebe
N	Pied-billed Grebe
SF	Double-crested Cormorant
N	Great Blue Heron
N	Green Heron
RA	Cattle Egret
RA	Common Egret
N	Black-crowned Night Heron
N	Least Bittern
N	American Bittern
RA	Glossy Ibis
S	Whistling Swan
SF	Canada Goose
SF	Brant
RA	Snow Goose
RA	Blue Goose
N	Mallard
N	Black Duck
N	Gadwall
SU	Pintail
SU	Green-winged Teal
N	Blue-winged Teal
RA	European Widgeon
SF	American Widgeon
SF	Shoveler
SU	Wood Duck
R	Redhead
SFW	Ring-necked Duck
SFW	Canvasback
SFW	Greater Scaup
SFW	Lesser Scaup
SFW	Common Goldeneye
SFW	Bufflehead
SFW	Oldsquaw
SF	White-winged Scoter
RA	Surf Scoter
RA	Common Scoter
SF	Ruddy Duck
N	Hooded Merganser
SU	Common Merganser
SF	Red-breasted Merganser
SU	Turkey Vulture

Status	Species
SU	Goshawk
SU	Sharp-shinned Hawk
SU	Cooper's Hawk
R	Red-tailed Hawk
SUF	Red-shouldered Hawk
SU	Broad-winged Hawk
SFW	Rough-legged Hawk
RA	Bald Eagle
SU	Marsh Hawk
SU	Osprey
RA	Peregrine Falcon
SF	Pigeon Hawk
N	Sparrow Hawk
N	Ruffed Grouse
I	Ring-necked Pheasant
N	Virginia Rail
SU	Sora
N	Common Gallinule
N	American Coot
RA	American Oystercatcher
SF	Semipalmated Plover
RA	Piping Plover
N	Killdeer
SF	American Golden Plover
SF	Black-bellied Plover
SF	Ruddy Turnstone
N	American Woodcock
SU	Common Snipe
S	Whimbrel
N	Upland Plover
N	Spotted Sandpiper
SF	Solitary Sandpiper
RA	Willet
SF	Greater Yellowlegs
SF	Lesser Yellowlegs
SF	Knot
RA	Purple Sandpiper
SF	Pectoral Sandpiper
SF	White-rumped Sandpiper
SF	Baird's Sandpiper
SF	Least Sandpiper
SF	Dunlin
SF	Short-billed Dowitcher
F	Stilt Sandpiper
SF	Semipalmated Sandpiper
RA	Western Sandpiper
RA	Buff-breasted Sandpiper

Status	Species
RA	Hudsonian Godwit
SF	Sanderling
RA	Wilson's Phalarope
RA	Northern Phalarope
RA	Parasitic Jaeger
RA	Glaucous Gull
N	Great Black-backed Gull
N	Herring Gull
N	Ring-billed Gull
SF	Bonaparte's Gull
RA	Little Gull
RA	Ivory Gull
N	Common Tern
N	Caspian Tern
N	Black Tern
N	Rock Dove
N	Mourning Dove
SF	Yellow-billed Cuckoo
SU	Black-billed Cuckoo
SU	Screech Owl
N	Great Horned Owl
FW	Snowy Owl
N	Barred Owl
RA	Great Gray Owl
N	Long-eared Owl
N	Short-eared Owl
N	Saw-whet Owl
SU	Whip-poor-will
SU	Common Nighthawk
N	Chimney Swift
N	Ruby-throated Hummingbird
N	Belted Kingfisher
N	Yellow-shafted Flicker
N	Pileated Woodpecker
SU	Red-headed Woodpecker
SU	Yellow-bellied Sapsucker
R	Hairy Woodpecker
R	Downy Woodpecker
W	Black-backed Three-toed Woodpecker
RA	Northern Three-toed Woodpecker
N	Eastern Kingbird
N	Great Crested Flycatcher
N	Eastern Phoebe
SF	Yellow-bellied Flycatcher
SU	Traill's Flycatcher
S	Least Flycatcher
N	Eastern Wood Pewee
RA	Olive-sided Flycatcher
SF	Horned Lark
N	Tree Swallow
N	Bank Swallow
N	Rough-winged Swallow

Status	Species
N	Barn Swallow
N	Cliff Swallow
N	Purple Martin
RA	Gray Jay
R	Blue Jay
RA	Common Raven
R	Common Crow
R	Black-capped Chickadee
RAW	Boreal Chickadee
R	White-breasted Nuthatch
SFW	Red-breasted Nuthatch
R	Brown Creeper
N	House Wren
R	Winter Wren
RA	Bewick's Wren
RA	Carolina Wren
N	Long-billed Marsh Wren
N	Short-billed Marsh Wren
RAW	Mockingbird
N	Catbird
N	Brown Thrasher
N	Robin
N	Wood Thrush
SF	Hermit Thrush
SF	Swainson's Thrush
SF	Gray-cheeked Thrush
N	Veery
SU	Eastern Bluebird
R	Golden-crowned Kinglet
SU	Ruby-crowned Kinglet
SF	Water Pipit
N	Cedar Waxwing
W	Northern Shrike
SU	Loggerhead Shrike
R	Starling
RA	Yellow-throated Vireo
SF	Solitary Vireo
N	Red-eyed Vireo
SF	Philadelphia Vireo
SU	Warbling Vireo
N	Black-and-white Warbler
RA	Worm-eating Warbler
RA	Golden-winged Warbler
SF	Tennessee Warbler
SU	Orange-crowned Warbler
SU	Nashville Warbler
RA	Parula Warbler
N	Yellow Warbler
SF	Magnolia Warbler
SF	Cape May Warbler
SU	Black-throated Blue Warbler
SF	Myrtle Warbler
SU	Black-throated Green Warbler

Status	Species	Status	Species
SU	Blackburnian Warbler	R	Cardinal
SU	Chestnut-sided Warbler	SU	Rose-breasted Grosbeak
SF	Bay-breasted Warbler	N	Indigo Bunting
SF	Blackpoll Warbler	W	Evening Grosbeak
RA	Pine Warbler	R	Purple Finch
RA	Prairie Warbler	W	Pine Grosbeak
SF	Palm Warbler	W	Common Redpoll
N	Ovenbird	W	Pine Siskin
N	Northern Waterthrush	R	American Goldfinch
RA	Kentucky Warbler	W	Red Crossbill
SF	Connecticut Warbler	W	White-winged Crossbill
SU	Mourning Warbler	SU	Rufous-sided Towhee
N	Yellowthroat	N	Savannah Sparrow
RA	Yellow-breasted Chat	SU	Henslow's Sparrow
SF	Wilson's Warbler	SU	Vesper Sparrow
N	Canada Warbler	SFW	Slate-colored Junco
N	American Redstart	SU	Tree Sparrow
R	House Sparrow	N	Chipping Sparrow
N	Bobolink	N	Field Sparrow
N	Eastern Meadowlark	SF	White-crowned Sparrow
N	Red-winged Blackbird	SU	White-throated Sparrow
RA	Orchard Oriole	SF	Fox Sparrow
N	Baltimore Oriole	SF	Lincoln's Sparrow
SF	Rusty Blackbird	R	Swamp Sparrow
N	Common Grackle	R	Song Sparrow
N	Brown-headed Cowbird	SF	Lapland Longspur
N	Scarlet Tanager	W	Snow Bunting

List of Mammals

The following list is made from reports by the survey staff, ranges shown in Peterson's *Mammals of Eastern Canada,** and particularly from records of the species known to be or to have been in Presqu'ile Provincial Park, provided by the Department of Lands and Forests. The order and names follow those of R. L. Peterson's 1966 list. Species marked with an asterisk have been recorded in Presqu'ile Park.

* Common Shrew *(Sorex cinereus)*	A very common shrew of the Region.
* Smoky Shrew *(Sorex fumeus)*	Less common, a more northerly species than the preceding one.
Water Shrew *(Sorex palustris)*	A species to be expected in small cool streams in wooded land.
Pygmy Shrew *(Microsorex Hovi)*	This is the smallest North American mammal.
* Big Short-tailed Shrew *(Blarina brevicauda)*	A very common shrew in this Region.

Hairy-tailed Mole *(Parascalops breweri)*	Within its range in this Region.
* Star-nosed Mole *(Condylura lucifugus)*	A common mole, often found under old boards.
* Little Brown Bat *(Myotis lucifugus)*	Probably the commonest bat in the Region.
* Eastern Long-eared Bat *(Myotis Keenii)*	Rather uncommon.
* Least Bat *(Myotis subulatus)*	The Region is in the centre of the range of this bat.
Silver-haired Bat *(Lasionycteris noctivagans)*	A migratory species.
* Eastern Pipistrelle *(Pipistrellus subflavus)*	A migratory species.
* Big Brown Bat *(Eptesicus fuscus)*	A common bat.
Red Bat *(Lasiurus borealis)*	A migratory species.
Hoary Bat *(Lasiurus cinereus)*	Found in wooded areas.
* Varying Hare *(Lepus americanus)*	Found in dense woodlands.
* European Hare *(Lepus europaeus)*	Common in open fields.
* Cottontail *(Sylvilagus floridanus)*	Very common in fields and gardens.
Eastern Gray Squirrel *(Sciurus carolinensis)*	This species occurs in two phases, grey or black. Most in this Region are black.
* Red Squirrel *(Tamiasciurus hudsonicus)*	Common.
* Woodchuck *(Marmota monax)*	Very common in open lands.
* Eastern Chipmunk *(Tamias striatus)*	Common in wooded lands.
Eastern Flying Squirrel *(Glaucomys volans)*	Probably occurs in the Region.
* Northern Flying Squirrel *(Glaucomys sabrinus)*	Several have been collected in the region.

* Beaver *(Castor canadensis)*	Very common in 1969.
* Deer Mouse *(Peromyscus maniculatus)*	Common in the Region.
* Whitefooted Mouse *(Peromyscus leucopus)*	Common in the Region.
* Bog Lemming *(Synaptomys cooperi)*	Probably occurs in the Murray Marsh south of the Trent River.
* Meadow Vole *(Microtus pennsylvanicus)*	This must be by far the commonest mammal in the Region.
* Common Muskrat *(Ondatra zibethicus)*	Common in 1969.
* Norway Rat *(Rattus norvegicus)*	A native of Europe, now common to abundant.
* House Mouse *(Mus musculus)*	Common in houses and nearby fields.
* Meadow Jumping Mouse *(Zapus hudsonius)*	Common in suitable habitat.
Woodland Jumping Mouse *(Napaeozapus insignis)*	Common in suitable habitat.
* Porcupine *(Erethizon dorsatum)*	Common in 1969.
* Brush Wolf *(Canis latrans)*	Two brush wolves were seen by the survey party in 1969.
* Red Fox *(Vulpes vulpes)*	Radically reduced in numbers by rabies.
* Raccoon *(Procyon lotor)*	Common.
* Ermine *(Mustela vison)*	Common in hedgerows and woodland.
* Long-tailed Weasel *(Mustela frenata)*	Common.
Mink *(Mustela erminea)*	Known to be throughout the area near water.
* Striped Skunk *(Mephitis mephitis)*	Very common, with many roadkills.
Otter *(Lutra canadensis)*	Probably occurs sparsely.

Bobcat *(Lynx refus)*	Scarce to absent in this Region.
White-tailed Deer *(Odocoileus virginianus)*	Common.

* Peterson, R. L., *Mammals of Eastern Canada,* Oxford University Press, Toronto 1966.

Section 7

RECREATION RESOURCES AND QUALITY OF THE NATURAL ENVIRONMENT

> Nothing nature created is allowed to stand in the way of any artifact of man, however slow and marvellous was the former in becoming, however quick and rude the latter.
>
> Philip Wylie.

More than one hundred centuries have passed since the area bounded by the Lower Trent Region Conservation Authority was massively reshaped by snow and ice.

Nature has endowed this landscape with a type of scenic beauty found in few other areas of the province, yet overnight, it seems, man's "artifacts" are impinging, with a detrimental effect, on that which nature has created.

While many may proclaim the hills as being difficult to negotiate by car in winter, the land as being impossible to farm in spots, and some of the water, especially parts of the Trent River, as intolerable for various uses, people within the Conservation Authority must appreciate that with which they have been endowed. From the island studded views of Rice Lake and the glacial boulder till plain of the north-east to the shore of Lake Ontario and that area in between, the Lower Trent Region Conservation Authority has indeed been endowed with outstanding scenic attractiveness.

This area is fast becoming a destination for tourists. The Trent Canal, which wends its way through the Authority, has attracted many boaters in the past, and this use will, in all likelihood, increase in the future. Multi-laned Highway 401 provides access to the area from both east and west, and Highways 30 and 45 traverse the Authority, allowing local inhabitants and visitors from all parts of the country, and especially those from the urbanized area to the west, to make this their "playground."

Development to date has been mainly on the shores of the lakes and rivers, and occasionally on the slopes or the top of a particular hill affording a view of the surrounding landscape.

This pattern of development, however, is changing rapidly. The impact of recreational use of the land due to increased urban population, higher incomes, more leisure time, and improved transportation facilities need not be expounded upon at length here. The evidence of increased pressure is very apparent in the Authority.

Massive real estate subdivisions are being created in the Authority expressly for the urban market to the west. The permanent and seasonal population of the area is growing rapidly and, as a result, the very amenities which have generated development are themselves deteriorating in many places. Frequently, lots in these subdivisions are placed wholly or in part on flood plains and often they are equipped with inadequate sewage and drainage facilities.

Highway traffic volume is increasing with a corresponding effect on pollution of the atmosphere and the landscape. Litter and garbage are strewn along many of the roadsides, while garbage dumps and auto graveyards are proliferating. Beautiful, tree-lined roads are being devastated in the interest of moving more vehicles faster. For strictly technical reasons, trees and shrubs are removed indiscriminately from the road allowance, which is then sprayed with herbicides year after year to ensure growth does not take place. The resulting "view from the road" is one of desolation.

Industry spews affluent into both the air and the water, while boats add their scum of oil to already "troubled" waters. Many ponds, streams and lakes are being clogged by algal growth directly attributable to various chemicals and compounds such as detergents, fertilizers and sewage, which are carelessly added to these waters.

Swamps are drained, trees felled, and asphalt and concrete are laid down, all in the name of progress.

Spasmodic attempts are made at stocking fish and game, depleted by an unsuitable or hostile environment, while farmers and urban dwellers are constantly at odds over access to private lands. Private "conservation" areas, wherein trees are planted, ponds dug, game and fished stocked, are being established with varying degrees of success, and the public denied access to these lands.

Former Vice-President of the United States Hubert Humphrey stated that "Our surroundings can enrich or impoverish our lives. Thus conserving and improving our enviroment can add immeasurably to private and public happiness." To this may be added "and welfare" of the local community as well as the country.

Although all of the above is occurring at one place or another in the Lower Trent watershed, the landscape and the environment are not beyond recovery. Steps must be taken now, however, to ensure that the beautiful views are enhanced and preserved, that the waters are improved, that land and water access for the public is assured, and that the total environment is made such that it is a significant addition to the happiness and welfare of both the Authority and the province.

Herein lies perhaps the greatest challenge to the Authority - one of accepting progress and development, while ensuring that these take place in such a manner that the high quality of the natural environment is regained and preserved. It necessitates establishing or assisting in establishing controls to prevent further destruction of the environment, as well as providing areas where the environment and its potentials can be more widely enjoyed.

The area bounded by the Authority affords many opportunities for viewing the scenic beauty of the region, for fishing and hunting, for water-based activities such as boating and swimming, as well as for numerous scenic drives and walking trails. Many areas are suitable for tobogganing and snowmobiling. A few areas suitable for intensive recreational use, such as camping, exist in the Authority, but such facilities should be located and developed with careful reference to the Authority's role in conjunction with open space planning of other agencies.

The Authority may be roughly divided into three broad physiographic zones, each having particular potential for recreational activity.

A pastoral scene typical of much of the Lower Trent Region Authority. Note the "whalebacked" drumlin on the left.

Quality and variety on a scenic drive are not necessarily synonomous.

The first zone to the north and east of the Trent River is a boulder till plain. This zone is comparatively rugged, consisting of a veneer of glacial boulder till overlying the bedrock. This area has seen little recreational development as yet, probably because of the lack of any extensive bodies of water. This region would be suitable for extensive recreation developments such as walking, hiking, cross-country skiing, horseback riding and snowmobile trails, as well as wildlife observation, or nature study areas.

The second zone, that of the sand plains, embraces the Lake Ontario shoreline and extends north to the MacDonald-Cartier Freeway (Highway 401). Certain areas along the shoreline are undergoing intensive recreational development in the form of cottage subdivisions. Some opportunities exist for future Authority acquisition and development of areas which would provide public access to Lake Ontario for swimming, boating and picnicking. Other areas display potential for wildlife observation.

That region in between, the drumlinized moraine which includes the shores of Rice Lake and the Trent River, has experienced the most intensive recreational development to date. The waterfront is, of course, the preferred location of cottages and resorts, and it is here that development pressure is the greatest. This area is also suitable for some winter activities such as snowmobiling and tobogganing. While the topography in many instances lends itself to skiing, much care must be taken in selecting a site and investing dollars because of the uncertainty of the snow cover. This area receives approximately one-half the average snowfall that is received in areas such as southern Georgian Bay and Muskoka.

In general, recreational development to date has not been intensive in any of the above regions but, as noted above, pressure is increasing. That development which has occurred has been done with little planning and few, if any, controls, with the resulting degeneration of the environment and the landscape. E. M. Forster, the noted British novelist, once said: "If you desire to save the countryside there is only one way, through good laws rightly applied...that is your only hope. It needs men of goodwill who can continue on and work together lest destruction spread and cover the fields and hills with its senseless squalor. Now is the moment. Soon it will be too late." May the Lower Trent Region Conservation Authority heed these words and recover, enhance and preserve those resources, the stewardship of which it has requested and been granted. To default in this task would be an irrevocable calamity.

Section 8

HISTORICAL DEVELOPMENT

There can scarcely have been a time, since the arrival of man, that the Trent was not an important river. As a connecting link in the system left in post-glacial times by the retreat of the great lakes Algonquin and Iroquois, it pointed the way to the north for those who lived in close proximity to it as well as for others from longer distances away.

Within the historical period, from the seventeenth century, the river was a major route for numerous Indian tribes, including those of the Iroquois confederacy, Algonkin and Huron, and, apart from known recent occupation by Mississauga and Mohawk subgroupings, there are ample signs of fairly large (by Indian standards) settlement of the watershed. The river was, too, a dependable food source, with for instance an annual run of salmon up to the first quarter of the nineteenth century. With its lower tributaries, it watered land that was well suited to Indian agricultural methods. Champlain journeyed down the river in 1615, on perhaps his most important foray against the Iroquois, and he was impressed by the apparent richness of the land, with vines and "walnut" trees, and with the plentiful fish and game. "Along the shores," he wrote, "one would think the trees had been planted for ornament in most places."

It was after the American Revolution that settlement proper began, by Loyalists who from the mid-1780s came to Sidney, which was then virtually the western outpost of the settlements being established along the St. Lawrence and the lakefront. A partial survey of the township was made by a Lieutenant Kotte in 1787, and mill sites and suitable locations for trading with Indians were eagerly sought. Other settlers cleared the land and, in traditional style, sowed it with wheat which was almost a universal currency. One Kingston merchant, for example, wrote to his partner in Sidney, in 1790, to "oblige everyone to pay you in wheat...if they will not take 3s. 9d. for wheat, make them pay in money immediately."

Although Sidney was fairly well occupied by the late 1790s, the Trent was, for a time, effectively the line of settlement west. The site of Trenton was occupied by "Old Squire" Bleeker who, aside from trading with the Indians, ran a ferry across the river. It was not until 1834 that a bridge, 750 by 32 feet, was built and for years it was known as "the best bridge in Upper Canada." In 1806, a Captain A. H. Mayers constructed a sawmill about a mile from the bay front on the Trent, and later followed it with a grist mill. He also built sawmills in other townships, including one in Seymour where he cut large amounts of timber in the 1820s and '30s when the trade was already very profitable. Trenton itself was merely a cedar swamp until 1808.

In the years just prior to, and after, 1800, other settlers moved into the townships west of the Trent. Colbornes's first settler, James Keeler, came to Cramahe as early as 1789, and in ensuing years brought other settlers so that, the Authority's most westerly township, Haldimand, was being cleared for crops by 1797. To the north, Alnwick was for many years virtually an Indian reserve, and was surveyed to provide a reserve for wandering bands of Mississaugas in 1826. Until 1818, Mississaugas also occupied the northern side of the site of Hastings, but the southern side was granted to Loyalists from 1795. Settlement on the site of Brighton, with attractive mill sites on Brighton Creek, began after 1802.

For some decades after 1800, Murray was regarded as a somewhat backward

township agriculturally, but still an improvement on Seymour--notorious for years for its timber poachers--and Rawdon and Huntingdon which, though visited by surveyors in the 1790s, were regarded over a generation later as little more than remote pioneer settlements by the inhabitants on the lakefront.

Initially, and for the first quarter of the nineteenth century, the best timber stands were reserved for British naval purposes, as was the case throughout the province. During this time settlers used timber for various construction purposes and also burned woods for potash, much of which was forwarded to merchants, who in turn sent it to Quebec where it was exported. Potash was, in fact, for some years theprovinces's leading export.

However, as the demand for timber by merchants and exporters grew, from the first decade of the nineteenth century, there was considerable cutting in the wilderness areas of the townships by unauthorized persons many of them settlers. who found the new trade more profitable than simply farming. Some combined both pursuits. Seymour was particularly affected. Surveyor W. Browne, in 1819, wrote of great difficulties in completing his work because of "the plunder of lumbermen [which] is prodigious." Two years later he reported "that there is more lumber at present made and making on that township than any former year; this is a great grievance." The same year a local sheriff seized in Seymour "about Six thousand Pipe Staves—five thousand feet Square Oak timber, and four thousand West India Staves," from local persons and others from Murray and Percy townships. A decade later, when the cutting of timber was better regulated, the timber returns showed that such local lumbermen as Myers, Ferguson, McKenzie, Chisholm, Monahan, Phillips and Robertson, brought out of Seymour in one year, some 62,000 cubic feet of white pine timber, nearly 1,000 of red pine, 10,000 of white oak, 3,000 standard staves, 25,000 West India staves, and more than 7,000 standard saw logs. When, in the 1830s agricultural settlement of the township by retired military officers commenced, it was estimated that no valuable timber remained for several miles back of the Trent. In other townships, too, apart from cutting by limit holders, there was considerable timber poaching. Surveyors in Rawdon and Percy, in 1837, noted that, "the lumber has been plundered there from years since, as the lumberers only look for the Timber Trees . . . they send their Shanty parties into the Forest . . . but be careful not to be caught in the Act."

During the decades that followed, and as the lumbermen moved north and far away from the Lower Trent, millions of feet of square timber for Quebec and export, and of saw timber, including hardwoods, for the States from mid-century, moved annually through the area, and Trenton was commonly described as a junior version of Bytown (Ottawa) internationally known then as a lumbering centre without equal.

Lumbering activity required control of the Trent, but in fact the question of its development was for decades considered apart from that fact. In 1785, Benjamin Frobisher examined "the practicability of a Communication from Lake Ontario to Lake Huron" by way of the Trent, and while all his endeavours "to acquire some knowledge of it are far from being satisfactory," as nobody seemed to have any real information about the headwaters and connecting streams, he thought that "a Project that holds out so many advantages to the Province at large ought not to be relinquished." That was the thinking, on and off, for more than a century.

After tentative government surveys, and private schemes for a canal (including a lottery), a serious attempt was made, starting in 1833, to see the project through under government auspices. A civil engineer, N. H. Baird, provided a detailed plan for dams and locks measuring 134 by 33 by 5 feet depth, from the first nine miles of rapids above the mouth of the Trent, to Chisholm's Rapids, Beatty's, the confluence with the Crowe, and on through Percy Reach and eventually to Rice Lake for a total of approximately the equivalent of one million dollars, depending on the type of masonry and dimensions to be chosen. Later his plans included the upper reaches of the eventual canal and beyond.

Baird was understandably enthusiastic about the advantages to be gained by these developments, but in this he represented a large body of opinion. These advantages, he pointed out, were "not only to the country immediately contiguous, but to regions beyond." Settlers in the Trent watershed would be relieved "from the harrassing inconvenience experienced in dragging every species of commodity and provisions ... through, perhaps, the worst of roads in the Province," and the government would benefit immediately in the great increase in value of many thousands of acres of land. The timber and lumber trades would gain incalculably from the increase in volume that improvements would permit, and an end would be made to "that dangerous business of 'driving the river" to the destruction of much valuable property, and loss of life." What particularly caught his imagination was that merchants and settlers would be able to "have their goods shipped under their own eye at Montreal wharf, pass along the Lachine, Ottawa River, and Canals at Carrillion [sic], Chute Aux Blondeau [sic] and Grenville, along the Rideau Canal, up the Bay of Quinte, along the Trent navigation, Rice Lake and to Peterboro' without ever once being disturbed. "Even if the canal was to stop there, without being continued on to Georgian Bay, Baird anticipated that a large trade would spring up, with wheat, potash and forest products going to Montreal and Quebec as return cargoes.

That was an evaluation that remained nearly timeless. Baird, in his own time, succeeded in convincing the Commissioners appointed in 1833 of the practicability of his scheme. In 1837 the works were started under his supervision, and in two years government authorized loans of nearly $400,000. Less than half of this was spent when, in 1841, at the time of union of the two provinces, construction was suspended, and the money appropriated to more pressing financial purposes.

Afterwards the works were continued in piecemeal fashion as "an accommodation to the local traffic." A large sum was appropriated for works at Percy Landing in the mid-1840s, for instance, but the completed piers and booms quickly decayed and were eventually carried off by floods. Other projects during the same period of time included guide booms at Campbellford and a retaining boom of 2,600 feet at Crowe Bay.

A decade later, the cost of maintaining the slides and booms for bringing timber down the Trent so far exceeded the revenues obtained that the responsibility for maintenance was given over to private lumber interests, although navigational upkeep remained a public charge.

By Confederation, a total of $670,000 had been spent on improving the whole line of the Trent from the time that the works were first started. Despite the fact that, with railways and changed commercial outlooks, canals were often not favourably regarded, improvements continued to be made in the decades that followed. Between 1882 and 1889, too, the Murray Canal was cut across the five miles of land from the Bay of Quinte to Lake Ontario, providing a quick and sheltered outlet for Trent traffic.

In 1907 it was decided that the Trent could become part of a major freight-carrying route from Georgian Bay to Montreal and, up to 1918, new sections were built and older one repaired. However, the dimensions adopted were little different from those first suggested by Baird in 1833 and, as the connection through to Georgian Bay was also not fully realized, the freight traffic did not reach the scale envisaged.

In recent times the Trent has been considerably used by all types of recreational craft and, of course, the area as a whole has seen a great expansion of tourist and related facilities.

With some stretches of fine land, and with land on the whole superior to that to the north, the Lower Trent region has always been able to support commercial farming. In the early nineteenth century its farmers were among the first to import improved and pedigreed breeds of cattle into the province. From mid-century the region was one of the leading butter and cheese producing areas. Beef cattle, too, were important after confederation. Partly because of excessive cropping, the land at that time could hardly be made to grow wheat, and barley replaced it as a commercial crop but one which proved to be overly speculative. Hops and tobacco were also paying crops, after demand was first stimulated by the American Civil War. Tobacco remains an extensively grown crop today, especially on the sandy lands in the western townships of the Authority.

Because of the better quality of agricultural land, there was less of the wholesale desertion of farms, before and after the period of confederation, than that occurring in other parts of the province, where soil had been rapidly exhausted or had proved quite infertile. Nevertheless, with technological improvements, requiring fewer hands, and with the attractions of towns and cities, the farming population did decline. Haldimand had the greatest decrease. In the decade between 1851 and 1861, the number of its inhabitants increased from 4,634 to 6,164; by 1871 there was a decline to 5,796, which continued to 4,484 in 1891, 3,465 in 1911, 2,859 in 1931, and 2,486 in 1951, although in 1961 there was a slight rise to 2,803. The next township, Cramahe, had a less rapid decline, while at its front Colborne was growing. From 1861 to 1891, Cramahe's population went from 3,841 to 2,995; in 1911 it had 2,373 inhabitants, 2,224 in 1931, 1,994 in 1951, and a small increase to 2,124 by 1961. The village of Colborne during these years went from 806 in 1861 to 1,068 in 1891, 999 in 1911, 1,015 in 1931, 1,108 in 1951 and 1,336 in 1961. Much the same thing occurred in Brighton. The township decreased from 3,713 in 1861 to 2,451 in 1961. Brighton village, however, had a population increase in these years from 1,182 to 2,403. Murray, by contrast, had a fairly small decrease and an increase in recent decades from 3,612 in 1861, to 3,303 in 1891, 2,536 in 1921, 2,755 in 1941, 3,047 in 1951, and 4,558 in 1961. The Town of Trenton, at its front, has had increases from 1,398 in 1861, to 3,042 in 1881, 4,363 in 1891 and, after a small increase and decline, to 6,276 in 1931, and 13,183 by 1961. Sidney township, also contiguous to Trenton, and, of course, to the Belleville area to the east, is the exception. Its overall population has more than doubled between 1861 and 1961, from 5,082 to 11,397.

The rear townships have all experienced population losses. Huntingdon from 2,917 to 1,508 between 1861 and 1961, Rawdon from 3,591 to 2,151, Seymour from 3,842 to 2,546, Percy from 3,515 to 2,090, and Alnwick from 1,388 to 611.

The other town and village areas have, like those on the front, grown in size, Campbellford from 1,418 in 1881 to 3,478 in 1961, Frankford from 533 in 1891 to 1,642 in 1961, Stirling from 753 in 1861, to 874 in 1881 and 1,315 in 1961, and Hastings from 885 in 1881 to 897 in 1961.

Trenton, the largest of the urban areas, naturally benefitted from its position at the outlet of the Trent and from the fact that it was expedient for major railway lines to be run through it. Its industries in recent times have included lumber processing creosote preserving and the manufacture of paper, structural steel, machinery, clothing and flour. Some growth too has resulted from the nearby RCAF training base. Colborne and Brighton, also on the main Canadian National and Canadian Pacific railway lines, have been food processing and canning centres, and lumber mills and metal products works have also been located in the latter.

Industries that have been established in Frankford include a concrete pipe factory, a cannery, a cheese factory, paper mills, and a hydro plant. Carpets and woollen goods, aircraft seats and furniture, have been manufactured in Campbellford, and the town was also selected as the site of a hydro generating station. Stirling has been predominantly a dairy products centre, Hastings depending primarily on the summer tourist trade.

Section 9
GENERAL DESCRIPTION

1. POPULATION CHARACTERISTICS AND PROJECTIONS

a. *Population Characteristics*

The population characteristics of the Lower Trent Region Conservation Authority were examined for the period between 1911 and 1968 inclusive and are shown by municipality and County in Table 9-1. These statistics apply only to those parts of the municipalities lying within the Conservation Authority.

In 1968, the population within the Lower Trent Region Conservation was approximately 47,800, while in 1961 it was 44,000. This represents growth of approximately 8.6 per cent in a seven year period. By comparison, the province as a whole increased in population by 11.6 per cent in the same period.

The distribution of population is uneven within the Authority, but the overall population density is approximately 60 persons per square mile. Most of the population is concentrated in the southern portion along the lakeshore corridor. The northern, and particularly the north-eastern portions of the Authority, are only sparsely settled because of a lack of urban development. In addition, farm abandonment and farm consolidation are resulting in an absolute decline in the total permanent population in this northern and north-eastern part of the Authority.

In contrast, townships adjacent to urban areas along Lake Ontario have experienced a rapid increase in population in the period 1961 to 1968. For example, within a ten-mile radius of Trenton is a population in excess of 80,000 persons. Murray township, which is within this area, has experienced a population increase of more than 20 per cent in the seven-year period. An investigation of the assessment rolls shows that more than 50 per cent of Murray township's residents are classed as rural non-farm.

This trend to greater urban development and rural non-farm development, in all likelihood, will change little in the future, and will therefore account for most of the anticipated population growth within the Authority. Modest growth can also be expected around some of the smaller urban centres north of the MacDonald-Cartier Freeway, such as Hastings and Stirling.

The population concentrations along the lakeshore will obviously have to bear the responsibility for most of the Authority's financial requirements, but it is this same population which will derive the greatest benefits.

b. *Population Projections*

The population projection for the Authority has been developed with the assumption that the growth will continue to be concentrated within the area covered by the lakefront municipalities. The projection is based upon the Preliminary Population Projection for Ontario, 1971-1991, developed by the Ontario Department of Treasury and Economics. The smallest unit for these projections is the county, in this case Northumberland and Hastings, and therefore the population projection for the Authority is only a reasonable approximation.

Figures 9-1 and 9-2 show the past and projected populations for the Lower Trent Region Conservation Authority, as well as the Authority population as a

Table 9-1

POPULATION BY MUNICIPALITY – LOWER TRENT REGION CONSERVATION AUTHORITY 1911 - 1968 * (X 100)

Municipality (Part within Conservation Authority)	Based on Dominion Bureau of Statistics								Based on Department of Municipal Affairs						
	1911	1921	1931	1941	1951	1956	1961	1966	1961	1963	1964	1965	1966	1967	1968
Town															
Campbellford	31	29	27	30	32	34	35	34	34	35	35	35	34	35	35
Villages															
Brighton	13	14	16	17	20	22	24	28	24	27	27	27	28	28	27
Colborne	10	9	10	10	11	12	13	15	14	14	14	14	15	15	15
Hastings	4	4	4	4	4	4	4	4	4	4	4	4	4	4	8
Townships															
Alnwick	8	7	8	7	6	6	6	7	6	6	6	6	6	7	7
Brighton	24	22	22	19	21	24	25	25	24	24	23	24	24	25	25
Cramahe	24	22	22	20	20	20	21	22	20	20	21	21	21	21	21
Haldimand	30	26	24	23	21	23	24	25	24	25	25	25	24	25	26
Murray	28	25	27	28	30	36	46	54	45	50	51	54	55	54	55
Percy	28	26	24	22	21	22	21	20	22	22	21	21	20	21	21
Seymour	27	22	21	20	20	20	20	20	20	20	21	21	21	21	21
Sub-total-County															
Northumberland	226	207	205	199	207	224	239	253	238	246	249	251	251	256	261
% Change		-8.7	-0.7	-2.8	3.9	8.1	6.9	5.8		3.5	1.0	0.9	0.2	1.8	1.9
Town															
Trenton	40	59	63	83	101	115	132	137	129	138	141	141	138	139	140
Villages															
Frankford	–	8	9	11	14	15	16	18	16	17	17	16	18	19	19
Stirling	8	8	9	10	11	12	13	14	13	13	14	13	13	14	14
Townships															
Huntingdon	10	8	8	8	7	7	7	7	7	7	7	6	6	6	7
Rawdon	23	21	20	18	17	17	17	16	17	17	16	15	16	16	15
Sidney	14	12	12	13	28	36	38	39	21	22	22	24	24	23	24
Sub-total-County															
Hastings	96	116	121	144	176	201	222	231	203	214	217	216	215	216	218
% Change		21.4	4.1	18.8	16.7	12.3	10.4	3.8		5.4	1.7	-0.6	-0.2	-0.4	0.7
TOTAL	322	323	326	343	385	426	462	484	440	460	466	467	467	472	478
% Change		0.3	1.0	5.2	12.2	10.6	8.5	4.8		4.4	1.3	0.2	0.0	1.1	1.3

* Source – Ontario Department of Municipal Affairs, *Ontario Population Statistics*, A report prepared by the Community Planning Branch, 1967.

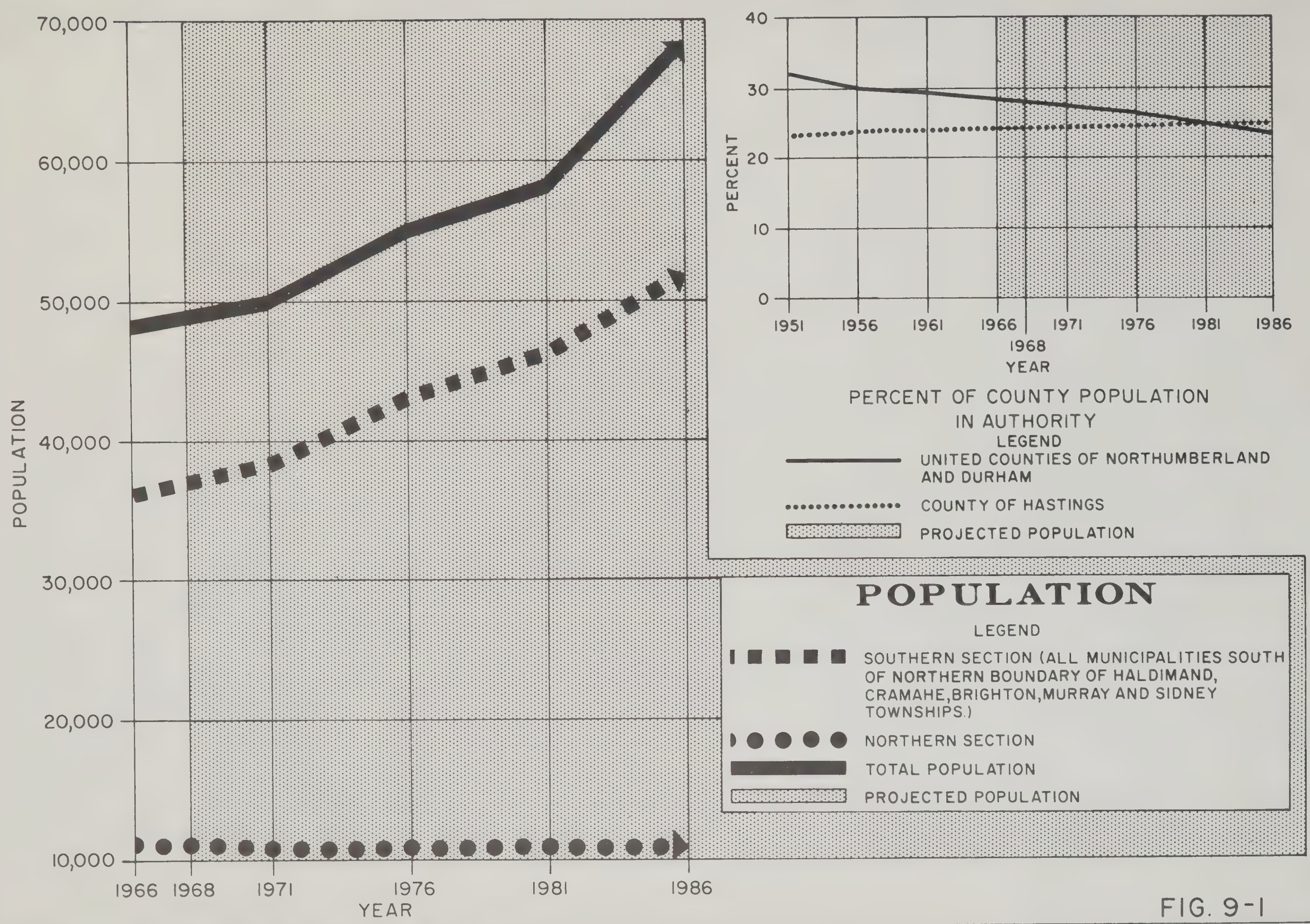

70,000
60,000
50,000
40,000
30,000
20,000
10,000
POPULATION
1966
1968
1971
1976
1981
1986
YEAR
40
30
20
10
0
PERCENT
1951
1956
1961
1966
1971
1976
1981
1986
1968
YEAR
PERCENT OF COUNTY POPULATION
IN AUTHORITY
LEGEND
UNITED COUNTIES OF NORTHUMBERLAND AND DURHAM
COUNTY OF HASTINGS
PROJECTED POPULATION
POPULATION
LEGEND
SOUTHERN SECTION (ALL MUNICIPALITIES SOUTH OF NORTHERN BOUNDARY OF HALDIMAND, CRAMAHE, BRIGHTON, MURRAY AND SIDNEY TOWNSHIPS.)
NORTHERN SECTION
TOTAL POPULATION
PROJECTED POPULATION

FIG. 9-1

Table 9-2

LABOUR FORCE BY INDUSTRY GROUP, 1951 AND 1961
NORTHUMBERLAND COUNTY AND TRENTON*

		Total All Industries+	Agriculture	Fishing and Trapping	Forestry	Mines and Quarries	Manu-facturing	Con-struction	Transport Communication & Utilities	Trade	Finance Insurance Real Estate	Services (Incl. Public and Defence)
Northumberland	1951	11,638	3,708	31	25	13	2,769	771	807	1,321	183	1,902
	1961	14,413	2,919	17	31	44	3,112	924	1,030	1,786	292	3,998
	% Change	23.8	-26.4	-82.4	24.0	238.5	12.4	19.8	27.6	35.1	59.5	110.0
Trenton	1951	3,893	31	1	1	-	1,179	281	380	525	72	1,376
	1961	4,846	28	-	-	4	1,213	187	337	679	108	2,203
	% Change	32.9	-10.7	-100.0	-100.0	400.0	2.9	-50.2	-12.8	29.3	50.0	60.1
Province of Ontario	1951	1,884,941	201,482	2,259	23,030	30,653	615,358	127,494	158,125	267,267	61,728	379,129
	1961	2,393,015	168,775	2,185	17,935	42,660	643,284	153,866	195,223	370,540	98,454	648,390
	% Change	27.0	-16.2	-3.3	-22.1	39.2	4.5	20.7	23.5	38.6	59.5	71.0

* Source: *Economic Survey, Lake Ontario Region;* Ontario Treasury Department (Finance and Economics), May 1968.

+ Includes persons not reporting industry

per cent of the pertinent county population. The past and existing population of of each municipality, or part thereof within the Conservation Authority, was calculated as a percentage of the total county population for each of the years indicated in Table 9-1. These past population growth rates were analysed to determine any obvious trends. An estimate was then made of the percentage ratio of each municipality's population, to the total projected county population, in each of the years 1971, 1976, 1981 and 1986. Because of the current and anticipated high growth characteristics in the lakeshore municipalities, the past and projected population figures for this area were aggregated, and separated from the remainder of the figures for the Authority.

It is clear from Figures 9-1 and 9-2 that most oft the growth within the Authority can be anticipated in the urbanizing corridor between the shore of Lake Ontario and the MacDonald-Cartier Freeway.

2. SOCIAL STRUCTURE AND INSTITUTIONAL ARRANGEMENTS

Traditionally it has been relatively easy to divide the area within the Lower Trent Region Conservation Authority into urban and rural categories of both land use and social structure. Recent trends in this area as elsewhere in the Province have resulted in a breakdown of these previously well-defined arrangements. The abandonment of marginal farms and the consolidation of farms into larger more economically viable units is leading to a relative decline in the total population within the rural parts of the Authority. A coincident major increase of urban population in the established centres, as well as a substantial amount of permanent and part-time non-farm development in the previously rural townships abutting these urban centres is occurring.

The immediate impact of such changes is obvious, but the social and institutional readjustments are more subtle and perhaps more significant. For example, many of those who have left previously rural areas require industrial training and a considerable period of adaptation to urban living. With an increasing rate of farm abandonment and depopulation, and coincident shrinking local tax base, rural municipalities find it increasingly difficult to provide even the low level of services traditionally expected by the rural resident, because of increasing costs of these established services. In most of the municipalities the answer is sought through the encouragement of additional non-farm residential development. Such development accommodates persons who have little interest or knowledge of the problems which confront the rural municipalities. Their concern is for a home in a passive rural atmosphere, within easy commuting distance of well-paying urban jobs. In several of the municipalities such as Murray township, the rural non-farm population exceeds the long time farm residents. The scene for the traditional rural-urban conflict of views and objectives is established. One of the first results of such a change in the local social structure is pressure for changes in local government administration and priorities, to give higher levels of service to the semi-urban population concentrations.

In considering programs or projects, the Authority must give careful consideration to these local social characteristics, since the implementation of projects requiring general public participation and acceptance could be jeopardized, if the various interests of the residents are not accommodated. The influx of non-farm residents, and part-time residents seeking relief from urban congestion through the acquisition of abandoned farms or small holdings will substantially alter the approach which the Authority must take in the implementation of projects and programs. Usually these individuals are concerned with the preservation of rural objectives. Their support will have to be actively sought by the Authority, and this may necessitate concentration of Authority activities into

time periods which are coincident with the presence of the part-time residents in the area, and focus on areas of high recreation potential.

At present, there are 17 local municipalities in the Authority. Each has a varied assessment base and administrative structure for handling problems associated with a changing way of life and economic activity within the area. The possibility of Regional Government as a solution to current problems is being seriously considered through two detailed studies. The first is being carried out by the United Counties of Northumberland and Durham, with the assistance of consultants; the second involves Durham county as part of the Oshawa Area Planning and Development Study (OAPADS). There appears to be little doubt that either or both studies will recommend readjustment of existing local government structure, and this will in all likelihood assist the Authority in carrying out it's already regionally oriented programs, and projects, because the Authority will be dealing with fewer local governments.

3. MAJOR TYPES OF ECONOMIC ACTIVITY AND EMPLOYMENT

Statistics for economic activity and employment are compiled by the Dominion Bureau of Statistics (D. B. S.), on a county basis, and for certain urban centres. It is, therefore, not possible to meaningfully aggregate these statistics for the area within the boundary of the Lower Trent Region Conservation Authority. However, by using the statistics for Northumberland county, and the Town of Trenton, it is possible to generally interpret the economic activity and employment characteristics of the Authority. The statistics for the county, which include the urban areas, give a good indication of the characteristics of the Authority as a whole, while the Trenton statistics fairly describe the urbanizing area.

Table 9-2 shows the distribution of employment by major type of economic activity in 1951 and 1961, and compares this distribution to that of the province as a whole. An examination of this Table shows that the growth in job opportunities in Northumberland county as a whole has been approximately three per cent behind that of the province as a whole. However, in Trenton, which is typical of the larger urban centres, the overall growth in employment opportunities has exceeded that of the province by approximately six per cent. The decline in agricultural jobs has been most significant, exceeding the decline in the province as a whole by more than ten per cent. The increases have been most marked in the manufacturing and services sectors, with the greatest increase of 110 per cent being in the service activities such as health services, education and financing. This is principally due to centralizing programs and normal forces which are concentrating such activities in established urban centres, thereby increasing employment opportunities in total.

Recreational demands normally increase with urbanization and, because the Lower Trent Region Conservation Authority is within one and one-half hours driving time of the large Toronto population, it is reasonable to assume a substantial future growth in the labour force service sectors related to the recreation industry. The implications of this on the activities of the Authority must be considered. The implementation of certain Authority projects of a recreational nature in some of the more rural and remote parts of the Authority can provide employment opportunities to supplement marginal local incomes. However, the competing private demand for lakefront cottage sites, commercial resorts, and small rural holdings may make it difficult for the Authority to acquire lands for its projects at a reasonable price. The Authority will have to concentrate on land acquisition rather than developments in its initial years, if it is to successfully achieve its development objectives.

4. INCOME

Table 9-3 outlines pertinent statistical material on estimated personal income for the counties of Hastings and Northumberland in 1963. These statistics for the two counties are used to give an indication of potential operating difficulties that could be faced by the Authority. The statistics for Hastings may be somewhat misleading in that they include data on the City of Belleville which does not lie within the portion of Hastings county included in the Lower Trent Region Conservation Authority.

It is clear from this Table that the percentage of persons earning in excess of $6,000 per year is approximately half of the provincial figure. In addition, the percentage of recipients earning less than $2,000 is from approximately three to seven per cent greater than the same figure for the province of Ontario.

In developing its programs and establishing financial priorities, the Authority must keep this analysis in clear focus, since there is little doubt that the majority of the lower income recipients are generally located in the rural portion of the Authority. The Authority's funds will therefore have to come largely from the more prosperous urban centres and their abutting urbanizing townships.

In order to supplement incomes many owners of marginal farmlands or water frontage are turning to the sale of their lands in small holdings. Unfortunately the benefits of these actions are very short-termed, since the demand for additional services from the new owners inevitably leads to additional costs and administrative procedures which are beyond the administrative capabilities of most of the rural municipalities affected. Unfortunately however, this desire to supplement incomes through the sale of small parcels has made it socially unacceptable to implement the types of planning controls that would minimize any escalation in municipal service costs to the essentially rural based population.

5. CURRENT ECONOMIC GROWTH CHARACTERISTICS

As elsewhere in the province, urban-centred activities including personal services, manufacturing and recreation are becoming the dominant factors in the economic growth of any region. Labour mobility between jobs, places of residence and occupations becomes a vital necessity under this realigned employment structure. Labour retraining and reallocation of land resources is costly but necessary. In the Lower Trent area the existence of many non-viable farms and a high rate of farm abandonment is resulting in a sharp decline in the proportion of the labour force employed in agriculture.

These trends make it inevitable that the unproductive agricultural lands would be best allocated for recreational developments of various types to create employment opportunities for a reduced number of individuals who wish to remain in the rural part of the Authority. The physical amenities which make the area attractive for tourists and recreation development are further enhanced by the relative ease with which the area can be reached from major metropolitan concentrations such as Toronto and Oshawa by way of Highway 401 and the better north-south highway routes through the Authority. Fortunately there is still sufficient land with a high recreational potential upon which to establish recreational facilities by properly using planning techniques. This basic reorientation of local thinking requires the full co-operation of all municipalities in setting up standards of development and enforcing them uniformly so that the long-term balance between recreational demands and preservation of the physical amentities is achieved.

Table 9-3

ESTIMATED PERSONAL INCOME
HASTINGS AND NORTHUMBERLAND COUNTIES – 1963*

Jurisdiction	Earning Less Than $1,999 Per Year		Earning $2,000-$5,999 Per Year		Earning $6,000 and More Per Year		
	No.	% of Total Recipients	No.	% of Total Recipients	No.	% of Total Recipients	Average Personal Income
Hastings	9,528	31.6	17,114	56.7	3,530	11.7	3,090
Northumberland	3,141	26.8	7,591	64.9	965	8.3	2,921
Province of Ontario	611,901	24.3	1,495,558	59.6	405,383	16.1	3,678

* Based on statistics contained in *Lake Ontario Region Economic Survey;* Ontario Treasury Department (Finance and Economics), May 1968.

Except for the Town of Trenton, individual municipalities have neither the money nor the staff to implement and enforce such development controls in the manner required to achieve the above objective. Some form of joint action by groups of municipalities is obviously necessary, and already action is being taken in this direction through an overall planning study being carried out by consultants for the United Counties of Northumberland and Durham and the Lower Trent Region Conservation Authority, because of its objectives to manage wisely renewable resources, must take an active part in any such program of planning, and supplement it with a program of education. One method of achieving this is with local demonstration programs showing the best methods of treating a known specific problem of resource management.

6. URBAN CENTRES AND THEIR INFLUENCE

The balanced economic development of lakefront centres such as Colborne, Brighton and Trenton will determine largely the effectiveness of the Authority's programs. The assessment base of these urban areas will carry the major share of the Authority's costs, while the rural parts of the Authority will have to accommodate most of the projects, other than certain remedial channel works required in urban centres. In this way the urban residents who bear the costs, receive the greatest benefits because of their proximity to most of the projects.

In the more rural part of the Authority smaller urban centres such as Campbellford, Hastings, Stirling and Frankford can be expected to attract only limited urban growth and development, because of their location inland from the main lakeshore urban and transportation corridor. The growth will be further restricted by the limited sewage treatment facilities that can be developed in these upstream locations on the Trent River. The main functions of these centres will continue to be the provision of personal and retail services to the surrounding permanent population. Because of their location astride the Trent Canal system, these centres will also provide cottagers and users of the canal system with varied services such as accommodation, food and fuel during the main recreation season. The future importance of these centres in the rural part of the Authority should increase as additional recreational resources are developed.

In the area between the Lake Ontario urban corridor, and the smaller urban centres in the north part of the Authority, hamlets of various sizes are receiving different amounts of development depending on their accessibility to paved roads, their physical surroundings, and the availability of nearby employment opportunities. For example, Warkworth in Percy township is located at the intersection of two paved county roads, in a physically attractive valley near the new Warkworth Medium Security Institution. This combination of locational factors has attracted a modest number of new homes to the northern part of the hamlet. However, controls will be required to ensure no encroachment onto the broad flood plain within this settlement. Percy township has no such controls nor are these controls contemplated at the present time.

In contrast, Castleton in Cramahe township, consists largely of homes built in the 1940s and 1950s, with no major nearby employment opportunities, and few signs of potential development.

The modest potential for development within these rural hamlets lies in their attraction as sites for retirement homes.

7. LAND USE AND LAND USE REGULATIONS

Figure 12-2 shows the extent of permanent urban or suburban development and

Urban recreation on floodplain lands.

ndowners supplement incomes by sales of marginal farmlands, for non-farm development with little regard to physical hazards such
flooding

Urban centres located on the Trent Canal System can provide varied services for recreationists.

an development encroaches on floodplain lands, which should be set aside for Open Space uses.

arge tracts of shoreline abutting major water bodies or rivers are committed to present
future cottage development, with increased threats of pollution.

cottage development. In addition, this Figure shows the numerous Reference Deposit Plans placed on lands in order to facilitate their division into smaller holdings. It is apparent from this map that the main pressures for permanent urban development are concentrated in the lakeshore area between Lake Ontario and Highway 401. These pressures are significantly changing the overall land-use pattern in the previously rural townships abutting the older urban centres such as Trenton and Brighton.

The permanent urban type development occurring in this Lake Ontario corridor makes it imperative to have coordinated long-range planning programs. At present, each municipality is responsible only for the designated area under its jurisdiction. The planning programs of these individual municipalities range from nothing more than basic subdivision control to the full range of controls including Official Plan and Zoning By-laws, as indicated on Figure 9-2.

Until the summer of 1969, most of the municipalities in the Authority lacked even basic subdivision control. This situation led to the division of large areas within the rural municipalities into smaller parcels ranging in area from approximately two to ten acres by Reference Deposit Plans under the Registry Act. In laying out the lots within these plans, the owners paid little or no attention to the presence of flood plains, extreme slopes or similar physical hazards, which would preclude the use of all or part of the lots for any form of intensive development. These activities led to the imposition of subdivision control by Order of the Minister of Municipal Affairs on the rural municipalities lacking this control.

Most of the lots in these Reference Deposit Plans have already been sold to individual land owners at prices which far exceed the prices paid for land used for agricultural or other rural activities. The significance of these developments to the Authority is quite clear. First, the price structure of these small holdings is such that it precludes their purchase by the Authority for any of their projects, except very exceptional ones; and second, the Authority must as a matter of urgency examine in detail each of the Reference Deposit Plans, to determine the existence of physical hazards such as flood plains, erosion susceptibility, source marshes, or extreme slopes, and subsequently to impose fill and construction regulations pursuant to Section 26 of The Conservation Authorities Act, 1968. In developing the regulations under Sections 26 the Authority should give as wide publicity as possible, to ensure that all owners and regulatory agencies are fully conversant with the purpose of the regulations as well as their extent.

In addition to implementing fill and construction regulations for the areas referred to above, the Authority should give top priority to those areas experiencing the greatest urban pressures. A number of these areas have been mapped in conjunction with this Report and are referred to in Section 21. The regulations should generally cover flood plain lands and other lands lying between the rims of deeply-incised valleys. Once the regulations have been passed, the Authority should maintain the fullest co-operation with local municipalities to ensure that the regulatory policies and administrative procedures of these bodies are consistent and complement each other. Figure 9-3 shows a typical cross-section of a river valley and the types of land-use controls that can be applied to ensure sound conservation practices.

As local municipalities embark on more detailed planning programs, such as the preparation of Official Plans and Zoning By-laws, the Authority should encourage consultation, so that the physical hazard areas and the controls over them, as indicated in Figure 9-3, are incorporated into the appropriate mun-

icipal planning documents. In addition the Authority should assist local municipalities with established planning programs, to review the adequacy of conservation measures and sound resource management techniques within these documents. Extreme slopes (over 20 per cent), scenic amenity, and flood or erosion susceptibility, should be key elements of such reviews.

The lands adjacent to major water bodies and river systems such as Rice Lake and the Trent River have excellent recreational capabilities. As shown in Figure 12-2, virtually all of the shoreline abutting major water bodies or rivers has been committed to present or future cottage development, with little or no regard to the long-range potential of these resources. More recent development proposals are being applied to low-lying physically inferior lands which should be intensively studied before development occurs. In addition large scale cottage developments back from the shoreline and with no available public access to waters are being created. The overall effect is to destroy the very environmental amenities which initially attract such development, and may contribute to the deterioration of existing development.

To ensure the best long-range use of these resources, the Authority must encourage and assist member municipalities, either individually or preferably jointly, to initiate planning programs which will establish uniform development standards along all lakes and major rivers throughout the Authority.

8. TRANSPORTATION

Transportation facilities in the Authority are generally concentrated in the corridor between Highway 401 and Lake Ontario. Highways 401, 2, 30 and 31, as well as an expanding county road network, service this corridor with its concentration of urban centres, industry and lake-oriented recreation facilities. In addition, the Canadian National and Canadian Pacific main railway lines between Toronto and Montreal serve the corridor and thereby enhance the areas industrial potential.

In the remainder of the Authority, two-lane Highways, namely 45, 30, 33, 14, and 62, in combination with the expanding network of paved county roads, provide excellent access to the main urban service centres, as well as lands with high recreational potential throughout the Authority. The Canadian National Railway provides rail services to Hastings and Campbellford in the northern part of the Authority, and to centres along the Trent River in the east.

The Trent Canal System is an important recreational boating route, along which the Authority could develop access points and multi-purpose areas.

Numerous unopened or partly opened road allowances in all parts of the Authority could be developed for hiking and recreational vehicle routes. There are additional roads which are not cleared of snow in winter and these can be added to the closed road allowances and designated as snowmobile routes.

al non-farm residence. In some Townships the rural non-farm population exceeds the rural farm
ulation.

Competing demands for private cottage sites may make lakefront land acquisition difficult.

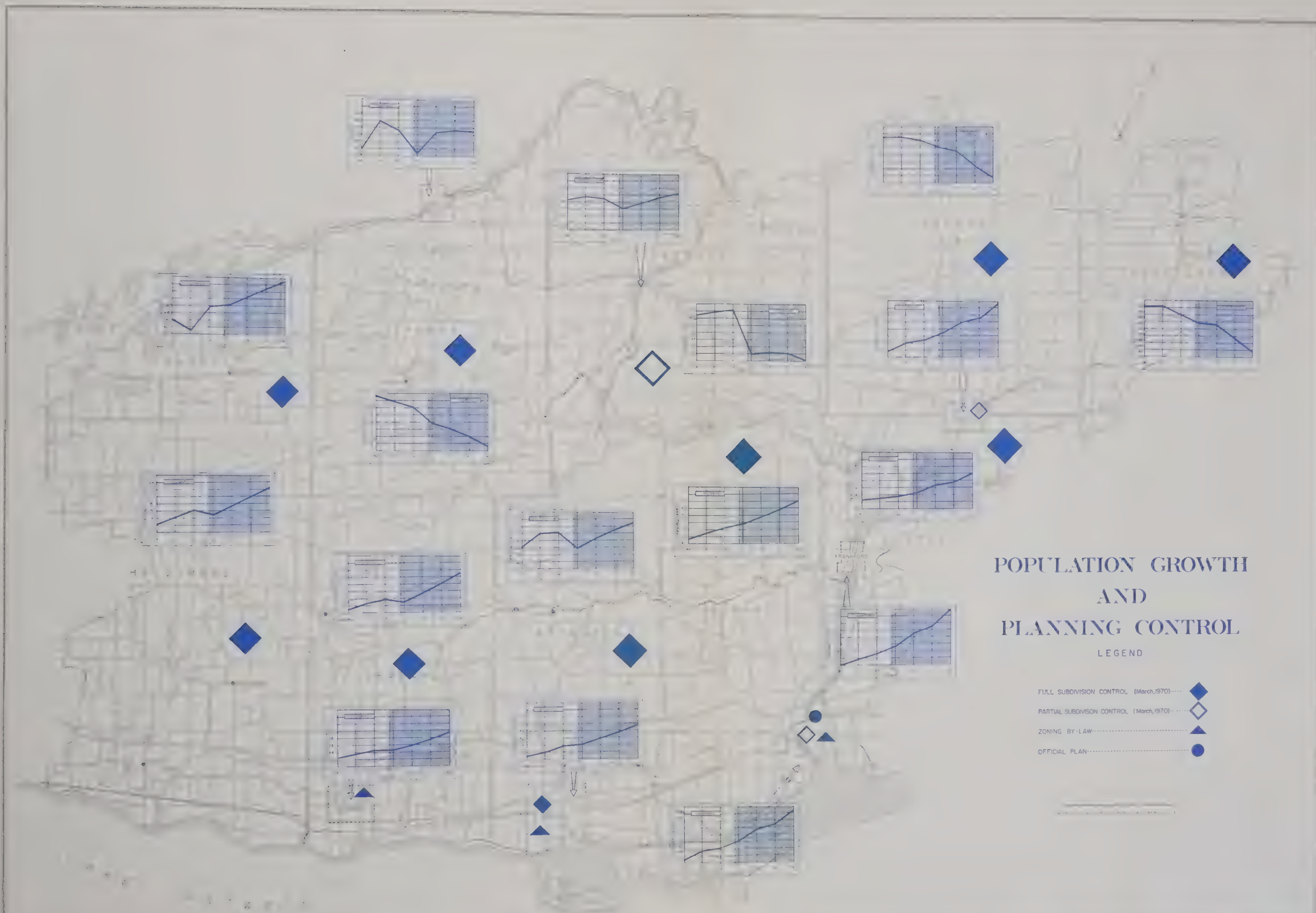
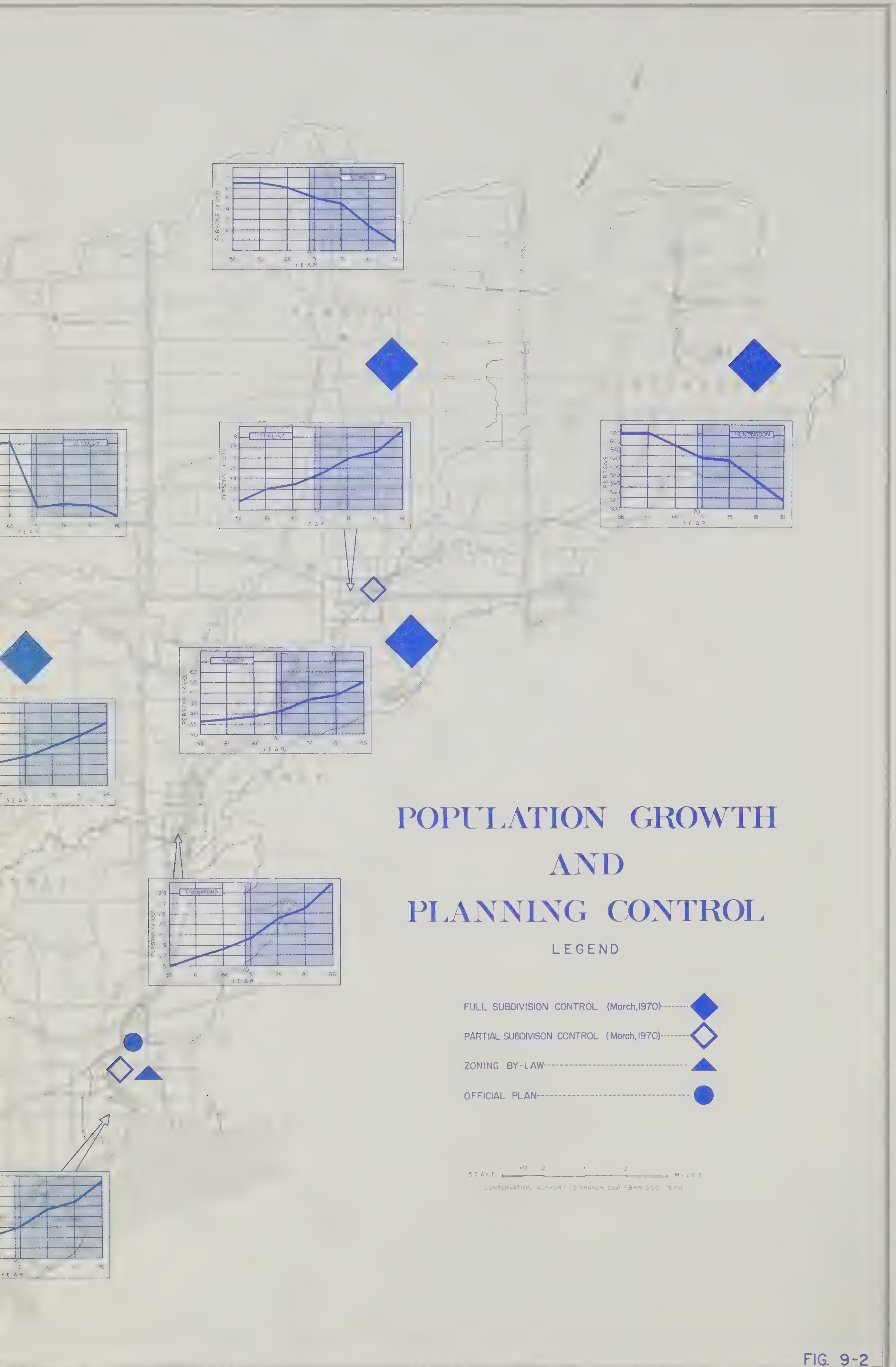
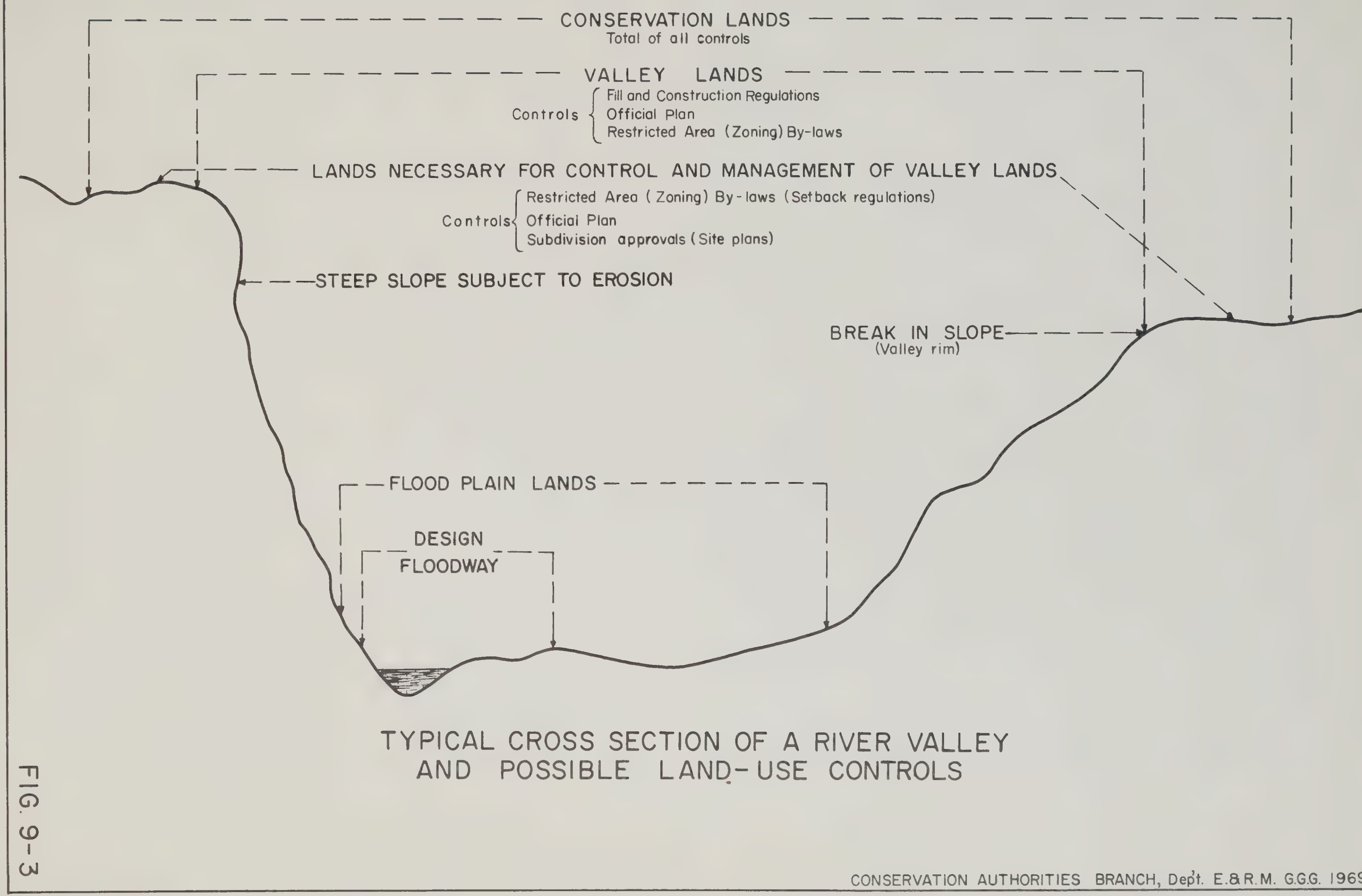

POPULATION GROWTH
AND
PLANNING CONTROL
LEGEND
FULL SUBDIVISION CONTROL (March,1970)
PARTIAL SUBDIVISON CONTROL (March,1970)
ZONING BY-LAW
OFFICIAL PLAN

FIG. 9-2



STIRLING
HUNTINGDON
FRANKFORD
PERSONS
YEAR
POPULATION GROWTH
AND
PLANNING CONTROL
LEGEND
FULL SUBDIVISION CONTROL (March, 1970)
PARTIAL SUBDIVISON CONTROL (March, 1970)
ZONING BY-LAW
OFFICIAL PLAN
SCALE 1/2 0 1 2 MILES

FIG. 9-2



TYPICAL CROSS SECTION OF A RIVER VALLEY
AND POSSIBLE LAND-USE CONTROLS

FIG. 9-3

Section 10

AGRICULTURE AND RELATED ACTIVITY

The agriculture economy of the Lower Trent Conservation Authority exhibits three prominent sectors, which are as follows: livestock operations, tobacco farms and tree fruit orchards.

The livestock operations are primarily concentrated on dairying to supply milk for cheese production. However, there are some livestock operations, with either hog or beef enterprises to provide diversification. Feed for these livestock operations are home grown to a large extent, with corn production showing definite increase as a source of domestic animal feed.

In the south-western portion of the authority, flue-cured tobacco is produced. Tobacco farming is a labour intensive type of operation. In addition large sums of capital are required for greenhouses, kilns for curing and specialized machinery. Due to tobacco acreage rights as set by the Ontario Flue-Cured Tobacco Growers Marketing Board, farm expansion is not only limited, but can be quite costly. Consequently, it would seem that expansion of this type of farming may be limited in the future.

Tree fruit orchards can be found in the loam type soils in the south-eastern portion of the authority. The orchards are for the most part small in acreage and in many instances provide a secondary source of income for the farm operator. A few orchards of larger acreages are operated by full time growers, and in some instances the fruit packing houses have acquired well-established orchards in order to maintain their source of supplies.

In addition to the three above mentioned agricultural enterprises, other agricultural activities can be found within the bounds of the Lower Trent Authority: canning vegetable farms, apiaries and ornamental shrub nurseries.

Probably the most serious challenge to the farming sector of the authority is the present trend of farmland fragmentation, especially in the southern and mid portions of the Authority. This severance of large blocks of farmland into 10-, 20- or even 50-acre blocks for hobby farms by non-farm persons has inflated land prices considerably. Consequently the prices of better agricultural lands are beyond the means of legitimate full-time farmers who would like to increase their production acreage. The farming areas in the northern portion have not been noticeably affected by the "urbanite" demands up to this time, hence farmland expansion and improvement has increased to a degree.

Some light may be shed on the recent agricultural trends in this authority by Dominion Bureau of Statistics census figures. By comparing the 1961 and 1966 census figures, it is apparent that the number of census farms has decreased while the acreage planted in crops has increased. Slight increases in the total number of cattle have also been noted. Moreover, home-grown feeds for livestock operations have increased with the most noticeable increase apparent in corn-based feeds, that is, corn grain and corn silage. These figures suggest farm intensification, particularly in the livestock production and associated animal-feed production.

Agricultural Crop Enterprises

To supplement the livestock operations in the Lower Trent Authority, forage,

corn and grain crops are cultivated by the farmers to reduce animal feed costs. Forage production either for stored feed or as a green feed supply are by far the largest total of acreages under cultivation. There is a definite preference for timothy-alfalfa mixtures by the farmers in the Authority as these mixtures provide a high hay yield and quality of feed source for cattle. In addition properly maintained grazing lands should be carried out by the farmers, by means of pasture renovation.

Hybrid corn cultivation has significantly increased in the past few years in the Authority as the nutritional aspects of corn feed have been readily accepted. Subsequent to the cultivation of corn either in the form of corn cobs or as corn silage, farmers have begun to install and acquire new equipment and facilities to store and process corn feed-stuffs. Furthermore, mobile corn mill services have provided a definite asset to the farmer. Oats, barley or mixed grain production for feed purposes has not increased significantly in recent years. Soybean production as a protein supplement to a feed program has made an initial start with a few farmers, but may take some time before large scale production is carried out by the local farmers.

Tree Fruit Orchards

Apple orchards are mainly concentrated on the old bench terraces in the vicinity of Highways 2 and 401 in Cramahe, Brighton and Murray townships. Many of the orchards are of old stock and hence many of the trees may be "boarders," although some selective removal has been carried out. Individual replacement of old trees is more common than orchard renovation, as the waiting period for new trees to bear fruit is several years. Orchards on a number of farms provide only a secondary source of income. Consequently the interest in orchard improvement is not apparent, especially for operators who are of semi-retirement age. In some of the orchards where they provide the operator's main source of income, renovation or expansion of orchard land may be carried out, although the limiting factor may be the availability of capital. The acquisition of sound, established orchards can be quite costly due to the present situation of inflated land prices. An orchard to be considered for acquisition must display several plus factors if the purchaser is to pay from $1,500 to $2,000 per acre for productive orchard land.This acre must have trees that are established but not too old, in order that some income may be derived by the orchard operator during the early year of acquisition.

Utilization of dwarf tree varieties in orchard renovation or development is desirable since more trees per acre can be planted. However, the dwarf varieties so far produced have not been sufficiently hardy to withstand the climatic conditions that prevail in this part of the Authority. As a result the local orchard operators have a definite apprehension of introducing dwarf and semi-dwarf varieties. Another problem common to the orchard operator is the lack of sufficient skilled labour during the harvest season. To overcome this difficulty the large orchardists utilize imported labour, but in order to do this, fairly extensive and diversified operations are necessary to fully utilize this type of labour keeping in mind that considerable expenses must be borne in securing this labour force.

The marketing of the apple-growers' produce is through local commercial packing houses, co-operative growers' packing houses and roadside stands for the very small orchard operators. The future of orchards is under question due to the demand for land for non-orchard purposes and the lack of young persons becoming involved as tree fruit operators.

Feed Mills

Feed mill operations were studied to determine to what extent their respective sales volumes were oriented to dairy rations, hog rations and poultry rations. The study found that two of the mills relied to a large extent on local supplies of grain, most of the mills lack large drying facilities, and all had to import grain from outside the Authority. Bulk feed, forwarded directly to the farmer from the feed company's main mill outside the Authority, has captured some of the market. Since many farmers have taken to raising cob corn, mobile mills to process corn have provided a definite service to the livestock operators. As previously mentioned dairying is rather prominent in the Lower Trent Authority. This is further illustrated by the fact that for the majority of feed mills approximately 50 to 60 per cent of their total sales have been to dairy farm enterprises.

Farm Equipment and Machinery

In a brief survey, the implement dealers within and adjacent to the authority were interviewed to ascertain present and future farm equipment marketing conditions. Most dealers handled for the most part tractors, harvesting equipment and specialty equipment appropriate for the immediate area serviced by the dealer. To a greater degree small sized (40 to 60 horsepower) tractors were offered. All dealers accepted trade-ins and their sales were evenly divided between new and used equipment. It is interesting to note that one dealer commented that the weekend or hobby type farmer tended to purchase used tractors instead of the new smaller machines, and the proportion of implement sales to hobby farmers varied from 0 to 25 per cent of this sales volume.

The purchasing of farm equipment on a partnership basis has not been readily accepted by local farmers. Probably the two main reasons for farmers not updating or improving their machinery inventory could be attributed to lack of available finances and the age of the farmers themselves. A farmer of semi-retirement age may be hesitant to become indebted by new acquisition. Sales and service for corn harvesting machinery have increased considerably in the past two years, in line with the increase in corn production for livestock food stuffs.

The degree of expansion of farming in the future in the Lower Trent Authority will undoubtedly have a marked effect on the farm equipment dealers.

Ornamental Shrub Nursery Operators

During interviews carried out with the various operators, it appears that no major expansion plans are contemplated by the nurserymen. Retail sales of products are for the most part directed to local trade, with a tendency to specialize in the types of shrubs offered, i.e., conifer, or deciduous shrubs and shade trees. Only one nursery operates solely on a wholesale basis.

From the brief inquiry on the nursery operations it is apparent that small, flexible operations can operate within close proximity to an urban centre, such as Trenton, and no serious competition for orchard land is evident from nursery operators.

Tobacco Farming

The production of flue-cured tobacco, which is a high cash value crop, has made a significant economic contribution to the south-western segment of the Authority. Tobacco cultivation began in this locality around 1955, when experienced farmers left the Simcoe-Tillsonburg area to establish farms on the sand and sandy-loams in the vicinity of Carmel, Centreton, Dundonald and Castleton. The increase in the number of tabacco farms has been gradual and as of April, 1969, 73 farms were established within Northumberland county. Of these, 53 are found within the boundaries of the Authority.* Most farms have up-to-date machinery and facilities for tobacco curing but the major problem is the acquisition of experienced labour during the harvesting period. Soil management problems should be under scrutiny at all times as well as crop rotations. Tobacco cultivation requires intensive cultivation and consequently soil erosion problems may occur, especially on the cultivated fields with steep slopes.

Commercial Vegetable Production

Production of vegetable varieties for commercial canning seems to be concentrated in the south-eastern portion of the Authority. Approximately 11,000 acres were planted and harvested for corn in 1969. The production of canning corn is on a contract basis with a food processing firm in Trenton. Also some acreages of pea varieties were cultivated on a contract agreement with farmers.

A commercial tomato processing plant in Colborne that operates on a seasonal basis, receives approximately 70 to 80 per cent of its requirements from the tomato growers in Northumberland county. In some instances the processor provides tomato plants to specific growers and the farmer in turn is contracted to deliver his tomato crop to the processing plant.

The future of contract vegetable production between farmers and food processors will undoubtedly be under constant review, following technical and marketing trends.

Livestock Enterprises

In the Lower Trent Authority, dairy farming accounts for the largest number of livestock operations by farmers, with their sales directed towards manufactured milk products. Following inquiries as to the type and number of livestock operations, 94 per cent of the dairy farmers indicated that the milk produced by their herds was shipped to at least one of the 11 cheese factories operating within the Authority. Most dairy herds were not large in number and in many instances hog operations were carried out by the dairy farmers in order to increase the use of farm facilities. A small number of combined beef-hog operations were evident in the Authority, while large scale beef cattle feed-lots were few in number.

It is apparent that as cattle-based farms increase in size, a greater emphasis to reduce feed costs will be uppermost in the minds of farmers. As a result, corn production will probably increase, as farmers attempt to reduce the operating feed costs. However, improper field husbandry can deplete the fertility of productive soils. Soil erosion conditions are now evident in a number of cultivated fields within the Authority.

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* By communication with the Ontario Flue-Cured Tobacco Growers' Marketing Board.

Table 10-1

FARM CENSUS FIGURES FOR MEMBER TOWNSHIPS OF
THE LOWER TRENT REGION CONSERVATION AUTHORITY (1961 and 1966)

Township	Year	Total Census Farms (No.)	Total* Acres Under Crops (Acs.)	Oats (Acs.)	Mixed Grain (Acs.)	Tame Hay (Acs.)	Corn Grain (Acs.)	Corn Silage (Acs.)	Total Cattle (No.)	Milk Cows (No.)	Hogs (No.)
Huntingdon	1961	192	11,789	4,002	206	6,586	45	156	4,436	1,918	2,735
	1966	169	16,528	3,036	468	7,695	132	754	4,866	1,937	2,865
Rawdon	1961	363	24,986	8,336	212	13,621	51	1,001	10,566	4,972	5,553
	1966	341	33,939	6,814	606	14,750	70	2,019	10,905	5,449	3,928
Sidney	1961	334	23,881	8,562	395	10,280	155	783	8,030	3,808	3,947
	1966	308	35,715	7,354	637	11,742	1,658	1,487	8,127	3,828	4,182
Alnwick	1961	95	6,364	2,292	221	2,696	7	201	2,583	879	1,546
	1966	77	5,843	1,445	606	2,963	27	282	2,450	849	1,356
Brighton	1961	255	15,287	4,849	398	6,190	48	370	5,148	2,426	2,490
	1966	236	15,564	3,611	1.065	6,959	806	780	5,160	2,216	2,884
Cramahe	1961	276	14,448	4,453	336	5,547	2	360	4,638	1,600	2,449
	1966	237	15,707	3,393	863	5,887	1,152	1,156	4,822	1,398	2,542
Haldimand	1961	299	18,516	5,420	319	7,759	130	581	7,586	2,253	3,198
	1966	287	20,109	4,539	609	8,959	1,522	1,323	7,845	1,728	3,490
Murray	1961	263	15,109	3,715	498	6,122	131	301	4,807	1,903	3,081
	1966	252	16,538	4,083	581	7,055	395	1,062	5,179	1,866	2,221
Percy	1961	300	20,321	6,574	586	9,252	53	855	7,958	3,229	4,252
	1966	242	20,149	5,757	855	9,694	917	1,122	7,882	2,785	4,870
Seymour	1961	365	26,194	9,256	627	12,563	63	1,255	10,949	5,124	5,924
	1966	326	26,545	7,392	817	14,127	195	2,044	12,065	5,447	5,509

* Includes field, vegetable, fruit and nursery crop land

Source: 1961 and 1966 Census of Canada: Agriculture - Ontario.

Section 11
FOREST RESOURCES AND RELATED ACTIVITY

1. EXTENT AND NATURE OF THE RESOURCE

The survey of local forest cover types showed no predominance of and one species or group of species. This survey was based on a system of sampling, designed to deliberately cross the general direction of all local physical features. Because the Department of Lands and Forests has instituted a major wildlife scheme on the Murray Marshes, which includes land purchases already completed, no detailed sampling of this area was done.

b. Forest Cover Types and Conditions

The principal forest cover types are ranked in each township as follows, in order of frequency and area.

Table 11-1

FOREST COVER TYPES BY TOWNSHIPS

Alnwick Township

10% and up	5.0 - 9.9%	1.0 - 4.9%
Aspen	Poplar-oak	Paper birch
White elm		Red oak
White cedar		White pine-red oak-white ash
Sugar maple		White pine
		Sugar maple-basswood
		Beech-sugar maple
		Ash-hickory
		Tamarack
		White oak

Brighton Township (Exclusive of Murray Marshes)

10% and up	5.0 - 9.9%	1.0 - 4.9%
Aspen	Sugar maple-basswood	Sugar maple
White cedar	Poplar-oak	White pine
White elm	Red oak	White pine-hemlock
Sugar maple		Ironwood

Cramahe Township

10% and up	5.0 - 9.9%	1.0 - 4.9%
White cedar	Sugar maple	Beech-sugar maple
Aspen	Sugar-maple-basswood	Paper birch
White elm	Poplar-oak	White pine-red oak-white ash
		White spruce-balsam fir-paper birch
		Red oak

Haldimand Township

10% and up	5.0 - 9.9%	1.0 - 4.9%
White cedar	Sugar maple	Sugar maple-basswood
Aspen	White pine	Red oak
	Poplar oak	Paper birch
	Beech-sugar maple	Silver maple-white elm
	White elm	White pine-red oak-white ash
		Hemlock

Huntingdon Township

10% and up	5.0 - 9.9%	1.0 - 4.9%
White elm		Silver maple-while elm
White cedar		Black ash-white elm-red maple
Sugar maple-basswood		Tamarack
Sugar maple		
Aspen		

Murray Township (Exclusive of Murray Marshes)

10% and up	5.0 - 9.9%	1.0 - 4.9%
Aspen	Beech - sugar maple	Black ash-white elm-red maple
White elm	Sugar maple-basswood	White pine
Poplar-oak	Sugar maple	Red oak
	White cedar	Ash-hickory
		Paper birch

Percy Township

10% and up	5.0 - 9.9%	1.0 - 4.9%
White elm		Poplar-oak
White cedar		White pine
Aspen		Silver maple-white elm
Sugar maple		White spruce-balsam fir-paper birch
Beech-sugar maple		
Sugar maple-		

Rawdon Township

10% and up	5.0 - 9.9%	1.0 - 4.9%
White elm	Poplar-oak	White spruce-balsam fir-paper birch
Sugar maple-basswood	Black ash-white elm-red maple	White pine
	White cedar	Red oak-basswood-white ash
	Silver maple-white elm	
	Aspen	
	Sugar maple	

Seymour Township

10% and up	5.0 - 9.0%	1.0 - 4.9%
White elm	Aspen	Silver maple-white elm
Sugar maple-basswood	Beech-sugar maple	Red cedar
	White cedar	Poplar-oak
	Sugar maple	Black ash-white elm-red maple

Sidney Township

10% and up	5.0 - 9.9%	1.0 - 4.9%
White elm	Sugar maple-basswood	Beech-sugar maple
Aspen	Sugar maple	Red cedar
Poplar-oak	White cedar	Red oak
	White pine	Black ash-white elm-red maple
		White pine-red oak-white ash
		Silver maple-white elm
		White oak

Examination of these listings by townships shows that although there is no major dominance of the Authority area by any one forest cover type, the prominence of wet site stands, white elm, white cedar and aspen, is consistent and this is particularly noticeable in Huntingdon township.

In these types there is a potential for future loss of the elm component to Dutch elm disease, and a potential for erosion damage to streambanks, if local woodlands are improperly managed and harvested on these lowland sites.

It is also apparent that a significant component of the Authority's woodlands is made up of sugar maple and its associates. Since this forest cover is usually directly related to higher class agricultural lands, it has experienced considerable cutting pressure in favour of agriculture. The potential of the remaining stands, however, is such that their care and management is a worthwhile venture.

Again, although white pine does not occupy a major acreage as a dominant stand, it is frequently represented as an additional species in many other mixedwood cover types.

Woodland Conditions

Survey observations showed the physical condition of forest to be as follows:

Spacing, or stand density, is the result of the exploitation that has occurred, as well as other pressures that have been placed on the forest. Regeneration descriptions indicate whether or not successful regrowth is occurring to replace trees that have been removed or that have died from various causes. Age classes indicate whether or not further forest exploitation is warranted or should be curbed. Important as well is the effect of local pasturing practices. These have affected forest cover since settlement, although to a different degree within different portions of Ontario. This is because, in some areas, changes in agricultural efficiency and practice have removed a great deal of the grazing influence in wooded areas.

Despite variations by township, most of the forest on private lands in the Authority's settled area is contained in two diameter ranges. These are the 4- to 10-inch range and the 10- to 18-inch range. Hence a universal degree of merchantability can be said to exist in local woodlands, mainly as small timbers and polewood, posts and pulpwood. Large saw-timber trees were found in small quantities in 1968.

The main portion of this forest cover is hardwood, but mixedwoods, occupy nearly a third of the woodlots examined on the tills and morainic lands of Alnwick, Haldimand, Cramahe and Percy townships. These are the areas where many remnants of the once great pine forests of the region are to be found, and in many cases these decendants of that era are reproducing and producing new and vigorous pine stands in mixture with hardwood species.

As has been previously noted, the effect of woodland grazing is rather variable in nature within the Authority. Changes in local livestock husbandry are indicated, and have led to the reduction of this problem when compared with other parts of Ontario. Despite the universally low incidence of fencing throughout the Authority, (10 to 15 per cent of the woodlots examined) the common heavy incidence of woodlot grazing of past years appears greatly reduced. The influence of tobacco

Up-to-date equipment, such as this priming machine can be found on several of the tobacco farms within the Authority.

Well stocked, all aged woodlots of the type shown here should be the aim of all woodlot owners in the Authority.

Woodlot grazing can destroy useful young tree seedlings and shrubs. This practice should be stopped.

growing on this trend has been suggested previously. However, in other areas newer trends of confinement feeding and the greater use of improved pasture, have also served to keep livestock out of woodlots.

Elsewhere, in Cramahe, Percy, Seymour and Rawdon townships, where up to half of the woodlands are still affected by grazing, encouragement by the Authority of such newer trends in livestock husbandry, accompanied by woodlot fencing, could be part of its future effort.

Two other woodland conditions of interest to the Authority, were observed in 1969. These are a high incidence of fair to poor regeneration, and an equally high incidence of fair to poor stand density. This is only partially explained by grazing effects. Another reason for poor reproduction is the relative intolerance to shade and root competition of up to 35 per cent of the woodlands within the Authority. Other poor management practices have contributed also.

Forest Plantations

Private forest plantations represent a significant form of cover within the authority. The plantations mapped and studied on the areas sampled represented 4.6 per cent of the total cover of commercially desirable tree species. The influence of the site of the Northumberland and Durham County Forest is obvious, since the greatest plantation effort has occurred in Haldimand township and the next greatest planation effort is found in the adjoining municipalities. The location of these townships on the main morainic area of the authority has obviously had an influence on private reforestation, due to the sandy soils that are present.

Examination of the plantations in the areas studied in 1969, revealed that the greatest effort on private land has occurred during the last 20 years, with most of the planting being done in the earlier half of that period. Outside of Christmas tree production, the average size of plantation is just over ten acres.

Christmas tree growing has received some recent impetus, since it represents about 23 per cent of the current reforestation area and the largest individual acreages planted and managed. These plantations range from 50 to 175 acres in area and are mainly in Haldimand and Cramahe townships. A natural control to the area planted to Christmas trees thus far has evidently been exerted by the competition of tobacco production and the facts that much of the land that is submarginal for agriculture is already wooded or is unsuitable by reason of drainage, topography, and property pattern.

Many local landowners plant mixtures of two or more species. Locally there has been a preference for Scotch pine, followed in order by red pine, white pine, jack pine, and white spruce. Occasional plantings were seen of white cedar, the larches, black spruce and some hardwoods, but generally there has been a limited (3.6 per cent) incidence of the species.

The commonly chosen planting method has been in the form of furrowed rows in sod usually in linear shaped blocks. Planting lines are commonly off contour. In an erosion prone region, such practices can contribute to erosion rather than prevent it, unless the erosion controlling role can be performed by ground vegetation until the trees are high enough to produce quantities of litter. Most sites should supply sufficient moisture for successful tree establishment. Particularly dry sites are common in Alnwick and Cramahe townships.

Local Plantation Functions

A shelter function is performed, intentionally or otherwise, by up to 16 per cent of the plantations examined in 1969. This function locally is of benefit to pasturing livestock, cash crops, and roads and lanes, in that order. Plantation sheltering buildings are few in number. There is private reforestation receiving shelter from hedgerows, other plantations, and natural woodlots. However, ten per cent of the plantations surveyed showed evidence of wind-shaping due to conditions of exposure.

Plantation Management

A number of management problems in private reforestation were observed during the 1969 survey. These indicated a particular need for cultural practices to improve tree form and stand densities, through pruning and thinning, on over half of the plantations sampled.

The incidence of damage to private reforestation can be ranked in descending order with the causal agencies.

These are:

1. Insects
2. Birds
3. Disease
4. Cattle and horses
5. Vandalism
6. Mice, rabbits, deer and porcupines.

Of this list, the more significant problems have been created by insects, birds and disease, in that order. The bird damage is mainly on Scotch pine Christmas trees, where bud damage has resulted in twig and branch malformation. The chief species involved is undoubtedly the pine grosbeak. Such damage is difficult if not impossible to prevent. *

Plantation Disease

The chief disease found in the plantations examined in 1969 was white pine blister rust. Its distribution within the township areas studied, indicates that it is somewhat scattered in its occurrence. A clustering of several rust incidences in one location, was found only in the Centreton-Carmel Area.

Assistance in control can be provided be removing the alternate host plants, which are members of the currant and gooseberry (Ribes) family. In addition, removing the infected trees, and constant inspection of individual plantations are both a help. It should also be noted that the domestic currants and gooseberries popular in country gardens are as great a source of infection as the wild species.

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* Bent, Eric C. and collaborators: *Life Histories of North American Cardinals, Grosbeaks, Buntings, Towhees, Finches, Sparrows and Allies.* Published by Smithsonian Institution Press, 1968 (Edited by O. L. Austin).

Plantation Insect Problems

The chief insect problem found in private plantations within the Authority in 1969 were white pine weevil, the European pine shoot moth, and the European pine sawfly. The European shoot moth appears to be more wide-spread within the authority, while the white pine weevil tends to concentrate in some areas. It is however almost as widespread as the shoot moth, more particularly over the southern half of the authority.

There are various methods of practical control for the white pine weevil. Underplanting is one of these, since it reduces the activity of this insect, which prefers the sunshine. High density stands can also be developed to cause more rapid straightening of damaged trees. The adult insects can be controlled by clipping and burning infected leaders, or by using insecticides on the litter in which the adults winter. Spraying the trees at precisely the right time in the spring has been effective also. At present systemic chemicals can also be used, provided that there is no danger to other organisms. *

Other insects occasionally found on local plantations in 1969, which may represent a problem, are the red-headed pine sawfly and the root collar weevil. Both of the sawfly species found are best controlled by using viruses. These should be arranged for through the local office of the Department of Lands and Forests.

The root collar weevil is a common problem in Scotch pine because it spreads easily from the strips of harvested Christmas trees, consequently presenting a threat to a whole plantation. This insect will attack red pine, jack pine and Austrian pine as well as Scotch pine. The adults feed on bark and twigs, but it is the larvae that create the greatest problem by girdling the base of young trees.

The root-collar weevil is best controlled by spraying the affected material in the spring or late September with commercial ethylene dichloride.

Private Plantation Growth

Representative height growth measurements were taken on private plantations throughout the Authority. These were compared with the height growth of trees situated in a red pine seed orchard in the Northumberland County Forest, since the orchard represented a number of desirable site conditions that had produced good growth. The measurements included examination of the bottom series of stem internodes on individual trees, in order to develop a picture of how many years are required for trees to begin consistent annual height growth after planting. This period of normally slow growth is called the "check" period, and varies according to species and site.

The height measurement comparisons do not represent a statistically significant number of plantations or a fair distribution, since there is a concentration of private forestation in one part of the Authority. They do however, provide the Authority with an insight into some aspects of local reforestation problems.

Despite its generally favourable capabilities for forestry, a variation in site conditions can occur within a very small area in the Authority, as shown by

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** Marty, Robert and Mod, D. Gordon; *Evaluating and Scheduling White Pine Weevil Control in the North-east;* U. S. Forest Service Research Paper N. E. 19, 1964. North-Eastern Forest Experiment Station, Upper Darby, Penna. U.S.A.

the measurements. All species have shown both long and short check periods, accompanied by good and bad height growth performances, within as little as a single plantation or field. There have also been cases of trees returning to periods of "check" for a time. The presence of ample available moisture on some sites, has inhibited some pine species and favoured white spruce. Some sites in Murray township are a particular example of this.

It is also apparent that, despite areas designated as having lower timber use capability in the north-eastern portion of the Authority, the growth performance of some plantations in that area are as encouraging as those found on better sites within the Northumberland County Forest. The Authority should therefore not hesitate to promote reforestation in its north-eastern region.

Primary and Secondary Wood Product Processing

Most of the sawmills situated in the authority operate by doing custom sawing for woodlot owners, who bring their raw material to the mill site. About one-third of the mills did not operate in 1969. Judging by the records of previous years, it is reasonably common for local mills not to operate for a year, or to operate for irregular periods of up to two months within any one year. The usual working crews in local mills number from one to four men. Employment opportunities, therefore, are poor in this type of operation within the authority.

Local woodlot production is still focused on sawlog material. The majority of this is hardwood, but with a respectable coniferous component still being included in annual log cuts. This has represented approximately one-fifth of the annual cut, judging by available production data, covering yearly periods from 1965 to 1969, and is therefore still significant. The coniferous species harvested are still mainly red and white pine. Hemlock, white cedar and spruce comprise the other species.

In hardwood harvesting, the major species have been maple, oak, elm, and basswood. During most recent years maple has been the leading species. In 1969, however, it was surpassed by elm, undoubtedly because of the desire of property owners to sell material infected by Dutch elm disease, before it became completely unmerchantable.

Between 1965 and 1969, the amount of material harvested has exceeded a million and a half feet locally. Total revenues derived from this raw material in Northumberland county and therefore for the general region of the authority, cannot be considered as high.

These totals are:

1965	-	$27,320
1966	-	57,975
1969	-	40,675

These figures are derived from all woodlot materials, including logs, pulpwood and posts, and cover private lands and the county forest system together.

It should be pointed out in discussing local forest economic data, that the amount of wood coming from outside the authority area to local mills is unknown. Also the actual amount that moves from the authority area to outside sources is unknown.

A portable sawmill operating in a private woodlot.

A well maintained Christmas Tree plantation located in the west central area of the Authority.

The effect of the portable sawmills, brought in from some distance, such as the Toronto or Marmora area, is most evident. Of the 41 current or nearly current logging sites examined in 1969, seven were the actual temporary sites of portable mills. Parts of the authority are also within the practical hauling distance of another 17 mills that are outside of the authority. The DOMTAR complex represents an obvious market for local woodlot products, particularly since virtually all local species but cedar can be utilized. However, pure pulpwood cuts represented under ten per cent of the current logging found in the 1969 survey. Pulpwood harvesting is more likely to be part of clean-up work in sawlog operations, as indicated by the incidence of this method in just under 30 per cent of the 1969 operations examined in the authority.

Section 12
OUTDOOR RECREATION AND RELATED ACTIVITY

At the present time a number of agencies both public and private provide facilities or open space for public recreation in the Lower Trent Conservation Authority. These include:

ONTARIO DEPARTMENT OF LANDS AND FORESTS

Provincial Parks
Fish and Wildlife Rearing Stations and Sanctuaries
Public Hunting Grounds
County Forests
Crown Land

Two Provincial Parks are found in the Authority: Presqu'île Provincial Park, located on Lake Ontario south of the town of Brighton and Ferris Provincial Park on the Trent River, south of Campbellford.

Presqu'île Provincial Park offers the recreationist more than 2,000 acres of shoreline, marsh, fields and woodlands as well as one and one-half miles of sand beach and approximately 500 campsites.

Ferris Provincial Park is as yet largely undeveloped but does offer picnicking facilities to the public.

An active fish hatchery and bird rearing station is located at Codrington, at which visitors are welcome.

The Department also operates a public hunting area adjacent to Highway 401, near Brighton, where hunting is allowed during the appropriate seasons.

The Northumberland County Forest is managed by the Department and offers a number of outdoor recreation facilities such as skiing and hiking.

In addition the Department owns approximately 1,400 acres in the Murray Marsh area, in which wildlife is protected.

ONTARIO DEPARTMENT OF HIGHWAYS

As well as being responsible for the planning, building and maintenance of highways, this Department operates a number of roadside pullouts for picnic purposes. These areas provide at least one picnic table and a garbage can and some also provide fireplaces. None in the area allow overnight camping.

ONTARIO DEPARTMENT OF TOURISM AND INFORMATION

Although not directly involved in offering recreational facilities in the area, this Department plays a very important role in publicizing the area through its publications and its Visitor Information Centres operated during the summer months at the Service Centres on the MacDonald-Cartier Freeway (Highway 401). The Department also operates the Canadian-United States Border Tourist Reception Centres which serve many visitors to the Authority, providing them with direction

and information. This Department is also responsible for the licensing of all tourist establishments and ensuring that these establishments adhere to the standards set out in the Department of Tourism and Information Act.

MUNICIPAL PARKS

Many municipalities have developed day-use parks which vary greatly in quality and recreation facilities provided. To date only one (Frankford Tourist Park) offers camping facilities. A complete list of the 14 Municipal Parks is not included here as they are located in Fig. 12-1 (Existing Recreation Facilities).

As yet no municipality in the Authority has established a park under the Parks Assistance Act which provides for a 50 per cent grant toward the total cost of land acquisition and development of a municipal park supplying overnight camping facilities or natural beaches.

FEDERAL DEPARTMENT OF TRANSPORT

This Department is responsible for the operation of the Trent and Murray Canals. Included in these facilities is the direct operation and maintenance of the canal and locks as well as the provision of a number of water and land access points and picnic areas. A more detailed description of the canal and its operation is found elsewhere in this report.

PRIVATE FACILITIES

In addition to the above government agencies offering outdoor recreation facilities and services in the Authority there are a number of privately owned and operated facilities. These facilities include private campgrounds, resorts and cabins, youth camps, marinas, and various types of clubs catering to groups such as hunters and skiers.

Nine private campgrounds are in operation in the Authority providing approximately 270 campsites and 100 trailer sites having parking, electric, and in some instances, sewage facilities. The majority (six) of these operations are well conceived and show a fairly high development potential. These are well maintained and are fairly successful operations. The remainder are rather poor in that they are over-used, poorly maintained or lack facilities. In some of these cases the low quality is due to the lack of interest of the operator.

Approximately 50 resorts consisting mainly of housekeeping cottages are operating in the Authority. These resorts have a capacity for about 1, 900 visitors.

To cater to the needs of the boating population approximately 15 marinas have been established. Twelve of these are found on Rice Lake and the Trent Canal, while the remainder are located on the Lake Ontario shoreline. The majority are well run operations providing adequate facilities to the boating population.

With regard to winter activities, three ski areas have been developed and a number of areas are open to snowmobiling. The most significant contributions to wintertime outdoor activities have been made in the Northumberland County Forest and by the Municipality of Batawa. The Oak Hills Ski Club also appears to be a viable operation.

Children and water — an inseparable combination.

Water, a tree and a length of rope provide an inexpensive popular summertime recreation facility.

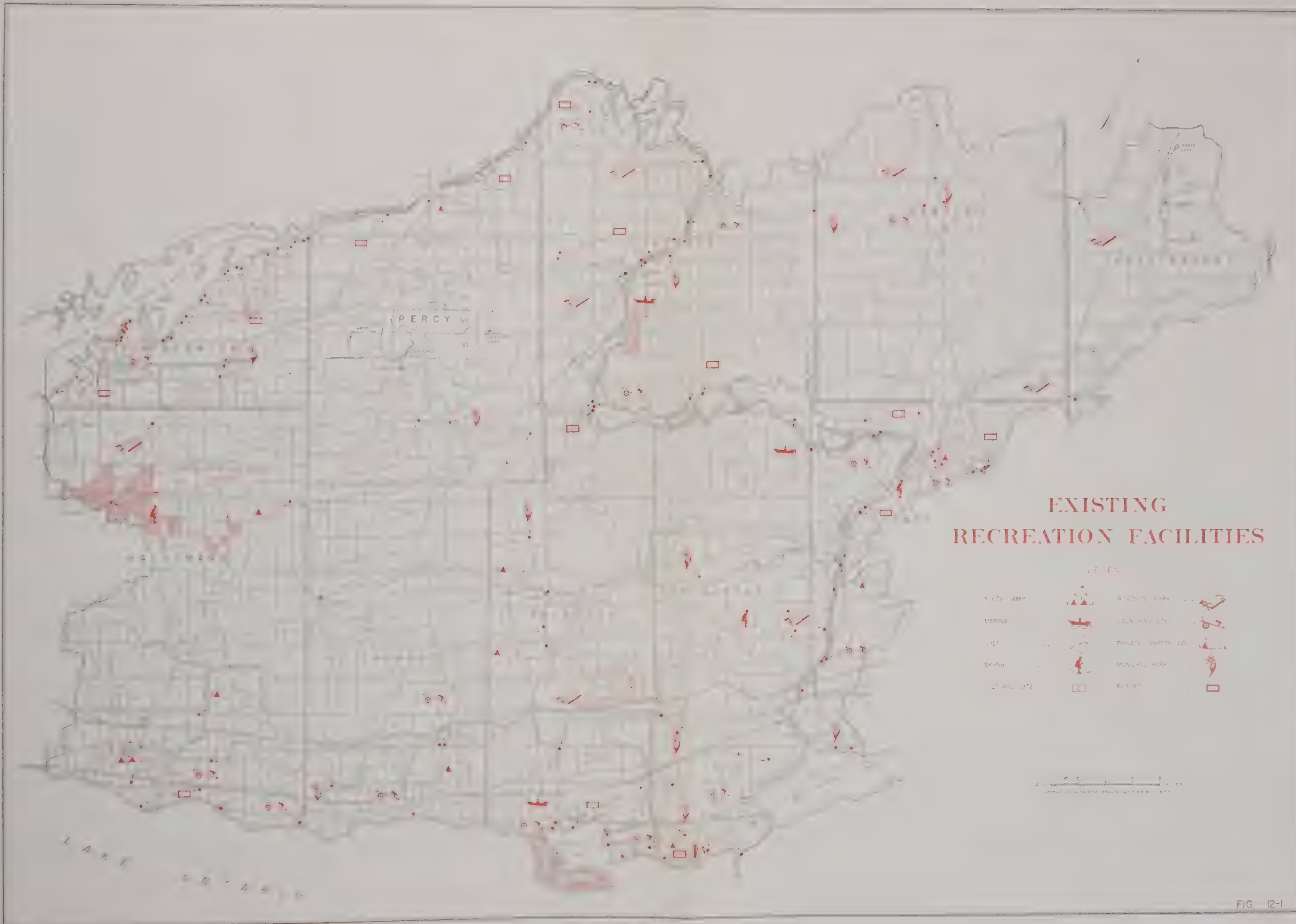

FIG. 12-1


EXISTING
RECREATION FACILITIES
YOUTH CAMP
ROADSIDE PARK
MARINA
LAUNCHING SITE
GOLF
PRIVATE CAMPGROUND
SKIING
CULTURAL SITE
SNAKE LAKE
WHITE LAKE
Crookston
MORELAND LAKE
OAK LAKE
Pether
C.P.R.

FIG 12-1

Outside of Presqu'île Provincial Park and the Northumberland County Forest extensive hiking or cross country skiing trails are non-existent in the Authority.

Up to the present time the above facilities for outdoor recreation were sufficient to meet the demand placed upon them. However, the demand for these types of facilities is growing. The growing urban population to the west is discovering this area as a summer "playground." In some cases members of this population have been attracted by the uncrowded conditions and the beautiful scenery and have established full time residence in the Authority, commuting to work in the Toronto area. This pressure will increase. Already large tracts of land have been acquired to be developed as residential subdivisions.

The local population is expanding (see Tables 9-1 and 12-1) and this growing local population will be seeking outdoor recreational facilities as well.

Another important facet of the recreation sector in the Lower Trent Region Conservation Authority is cottaging. Approximately 1,500 cottages were identified in the Lower Trent Region and this number will no doubt increase substantially.

While the majority of these cottages are located on waterfront lots along Rice Lake and the Trent River System and Lake Ontario, there is a growing tendency toward the establishment of summer residences on abandoned farmland.

As mentioned above, the tourist and recreation seeker demand is increasing. These people have made a significant impact on the economic development through expenditures of cash, purchase of land, food and materials such as building materials, clothes and sporting goods. For example the average vacation trip expenditure in the Lower Trent Region in 1966-1967 was $46. *

It is difficult to ascertain what the future number of visitations and expenditures will be, but in 1965 more than 166,000 persons from the Metropolitan Toronto Area visited the area under jurisdiction of the Authority. +

If the above figures are combined, a total in excess of $7.5 million is reached. Expenditures of this type can have a "multiplier effect" within the community. Part of the received tourist expenditure is immediately sent out of the area to pay for imported goods and services. Another portion is spent on goods and services obtained locally. The tourist purchases goods and services from the local retailer who in turn pays his staff, who also, in turn make purchases locally and so on. This pattern is known as the "multiplier effect." It has been found in the United States, (and the figures probably approximate those of Canada) that "for every dollar spent in the country by recreationists, the total economic activity generated is found to be $1.58 for tourists, and $1.62 for summer home owners."*

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* Lusty, Gordon, *A Study of Travel by the Residents of Ontario,* June 1966 - June 1967.

\+ Klopchic, Dr. P., *An Analysis of the Travel Habits and Expenditures of Metropolitan Toronto Households.* April 1964 - April 1965. Travel Research Branch, Ontario Department of Tourism and Information, Toronto, 1966.

** Clawson, M. and Knetsch, J., *Economics of Outdoor Recreation,* p.p. 61 et seq. Resources for the Future Incorporated. John Hopkins Press, Baltimore, 1966.

Thus it can be seen that tourism and recreation have a significant impact on the local economy.

Tourism and recreation also affect the social development of the region. Some farmers are abandoning their farms and moving to urban areas while others farm on a part-time basis only. Many of the farms, especially in the western sector of the Authority, are being bought by people who commute to the Metropolitan Area to work. Near Warkworth much farm acreage has been taken out of production and subdivided to be sold as building lots. These will probably be purchased by urban dwellers. The urge to escape urban living is becoming more and more noticeable and while the total population of the area may be increasing the social aspect of the inhabitants is changing from one with a predominantly rural background and concomitant way of life to one possessing a more urban outlook and ethic.

The growth in numbers of cottagers also affects the social development of the area. Large enclaves of cottages can affect the thought and outlook of the local residents. In some parts of the province, the summer cottage population exceeds the local permanent population, and cottagers are demanding a greater control of local matters sometimes becoming involved with municipal politics.

The influx of cottages and the problems associated with them are affecting the watershed in other ways. Already much of the developable shoreline of the Trent River and Rice Lake is built up with cottages, and developers are now turning to inferior shoreline sites on which to build.

Few regulations exist in any of the municipalities of the watershed to control developments such as those on, and north of, Wilson Island. These sites are subjected to spring flooding, and offer minimal drainage for sewage facilities. Tighter subdivision controls, Official Plans, and more stringent inspections by the local Medical Officer of Health offices are required. Steps should be taken now to control or halt the subdivision of inferior land.

In some instances the local municipality has provided for access points to the water, usually at the end of road allowances. Otherwise little suitable shoreline is available for future cottage development or for public access to water and to land from the water.

Many municipalities feel that cottage development is beneficial, especially due to an increased tax base. Often overlooked, however, are the hidden costs involved such as providing and maintaining roads which cottagers demand, as well as the cost of avoiding the despoliation of the environment through various types of pollution. Cottager-established refuse dumps are often poorly located, unsightly, uncontrolled, and act as active polluters. Garbage collection and supervised dumps should be provided.

While cottages are an important and integral part of the outdoor recreational opportunities existing in the Authority, steps should be taken to ensure that the carrying capacity of the river and lakes and streams and their shorelines is not over-extended, that the natural environment be preserved to the greatest extent possible, and that the opportunity exists for many people to enjoy the benefits of this resource.

"This area is for your use. Please help keep it clean"(!) An example of a dump informally established by cottagers. Such areas should be brought under control and carefully managed.

he final product of lagoon
velopment. Algae covered water and
adequate septic tank drainage.

The dredging of lagoons for cottage lot development should be discouraged.

PATTERNS OF COTTAGE AND URBAN DEVELOPMENT

FIG. 2-2

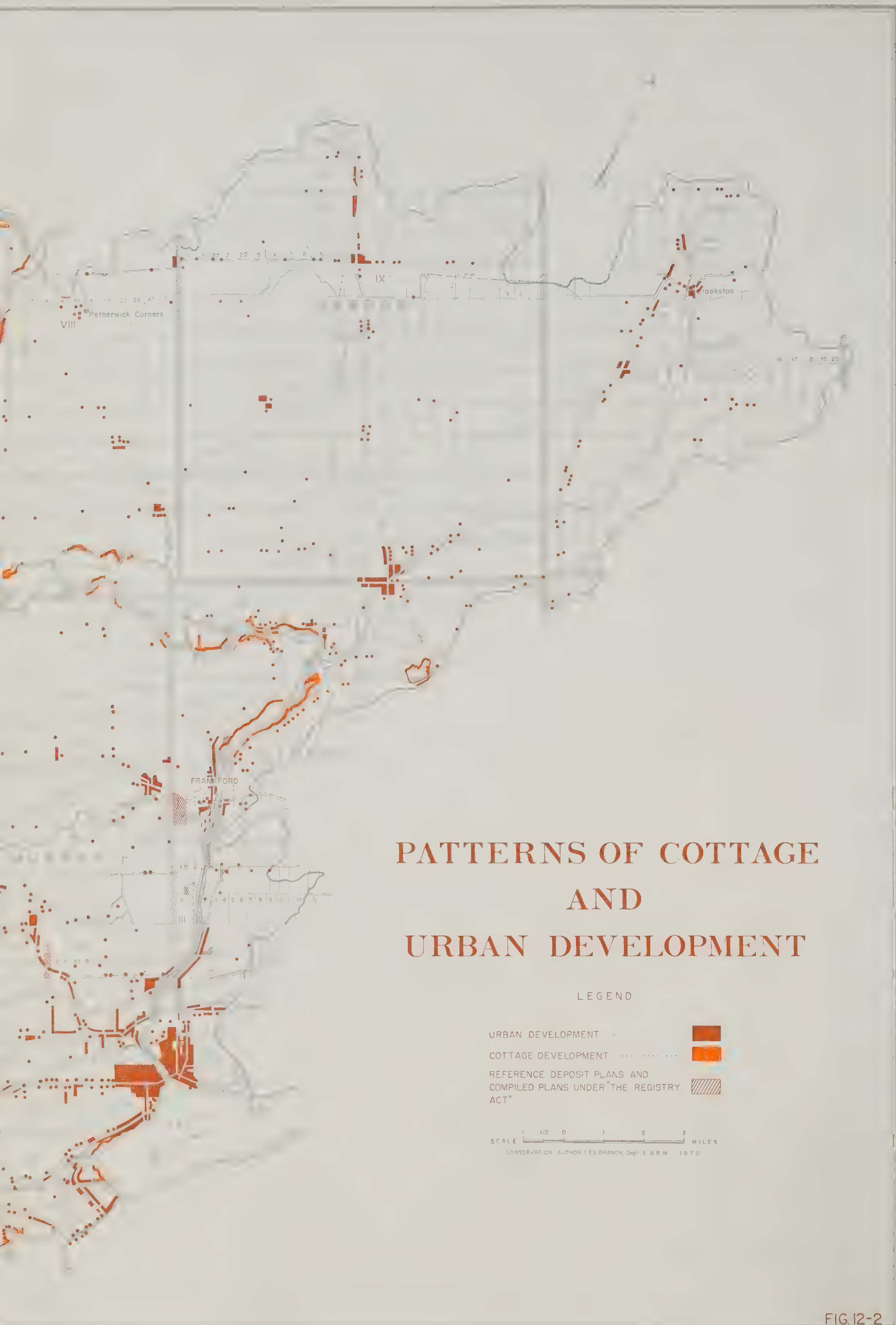

PATTERNS OF COTTAGE AND URBAN DEVELOPMENT
LEGEND
URBAN DEVELOPMENT
COTTAGE DEVELOPMENT
REFERENCE DEPOSIT PLANS AND COMPILED PLANS UNDER "THE REGISTRY ACT"
SCALE 1 1/2 0 1 2 3 MILES
CONSERVATION AUTHORITIES BRANCH, Dep't E & R M 1970
Petherwick Corners
VIII
IX
Crookston
FRANKFORD

FIG. 12-2

Facilities for recreational pursuits, be they active or passive, extensive or intensive, should be provided within the framework of a watershed plan, integrated with other resource planning agencies both inside the Authority and in neighbouring jurisdictions.

Some sites or areas are well suited for intensive use while others because of fragile ecological communities they support or because of unstable soils or easily polluted water, will permit extensive use only. This "carrying capacity" of an area is one important factor which must be considered in recreation area selection. In every case it is vital that the environment be preserved. If a site is obviously over-used and is deteriorating, it will seriously affect the environmental quality of the area.

Users of an over-taxed facility, one where the carrying capacity has been seriously exceeded, will leave the area with a distorted view of the environment represented. Meaningful perception of the environment is an integral part of the users total experience and the satisfaction which he derives from that experience.

The Lower Trent Conservation Authority possesses a number of recreational attributes the most significant of which is the beautiful scenery afforded to both the resident and the visitor as they traverse the watershed.

As the number of sites in the Authority which will sustain prolonged intensive use is relatively small, the Authority should concentrate on preserving the scenic environment, and establishing small areas from which the surrounding landscape can be appreciated. These would take the form of roadside pullouts, picnic areas, or walk-in viewpoints.

Care must be taken to ensure that the magnificent views are not spoiled by sprawling, suburban developments which would merely transplant an urban development to a rural setting, spoiling the recreational experience of viewing. Utility and highway rights-of-way should be planned and constructed in such manner that they conform to the landscape, and do not inflict ugly scars on that landscape, especially on horizons. This type of despoliation can be averted through the use of scenic easements, by which the present nature of the landscape may be preserved for the enjoyment of all.

As noted above, the Lower Trent Region Conservation Authority has the physical base on which to establish outdoor recreational facilities and to maintain what is already in existence.

Recent behavioural studies have indicated that people cannot live in close proximity with one another without conflicts arising. This coupled with the desire of urban dwellers to periodically escape the city, points to the need for outdoor rural recreational space. It is in the best interest of the community, the region and even the country as a whole if steps are taken to provide outdoor recreation opportunities for both present and future generations. The social well being of our citizens may well depend on the existence of these opportunities especially in future years.

A more detailed analysis of the Trent Canal corridor is included in the Appendix.

Table 12-1

POPULATION 1961 AND PROJECTIONS TO 1986

	1961	1971	1976	1981	1986
Northumberland County	41,892	50,000	55,500	63,100	70,40
Town of Trenton	13,183	16,300	18,500	21,300	24,50
Total "Lake Ontario Region"	335,063	402,900	451,100	508,600	572,30
Total Province of Ontario	6,236,092	7,787,500	8,753,200	9,891,300	11,166,70

Source: Lake Ontario Region Economic Survey 1968.

Section 13

RELATIONSHIP OF PRESENT ECONOMIC DEVELOPMENT AND WATER RESOURCE DEVELOPMENT

In previous years, economic development in the Lower Trent Region was closely associated with the development of water resources. Rivers and lakes formed the major transportation routes for the area and provided the means of harvesting timber. Water provided power for the operation of the numerous grist and saw-mills in the area. Of these many mill dams only four are presently using water power to operate mill equipment. Another water use which was extremely important to the region's economic growth was the generation of electricity.

At present, the region is traversed from east to west by Highway 401 providing the main transportation route for the area. Thus the importance of water for transportation purposes in the region is diminishing. However, the development of the water resources still remains an integral part in the economic development of the region. Although still quite abundant, these should be carefully allocated according to the various uses for domestic, industrial, agricultural, recreation and electric power generation purposes.

It is envisaged that future economic development will probably occur in the presently developed areas along the Trent Canal system and along the shores of Lake Ontario. It is quite apparent that future development is dependent on the availability of adequate water supplies at reasonable costs. A growing population requires water in ever-increasing amounts. Industrial processes, are rapidly becoming more complex, requiring greater quantities of water. Agricultural and recreational requirements for water are also increasing. Hydro-electric generating stations are to a large extent being replaced by thermal generating stations, thus reducing the requirements for power generation, although the new thermal plants use large quantities of water as a cooling agent. Therefore, economic development in the Lower Trent Region must be co-ordinated with water resources development.

l ruins approximately 1 mile south of
st Huntingdon on Rawdon Creek.

Ontario Hydro Trenton Generating Station and Trent Canal Lock No. 2.

Section 14
FLOODWATER DAMAGE

1. GENERAL

Accurate information regarding the severity and frequency of former floods is helpful in assessing the extent of floodwater damages in an area. Table 14-1 provides a list of historic floods in the Lower Trent Region. While this list is not an exhaustive one it nevertheless illustrates that flooding has been fairly widespread throughout the region.

Unfortunately, the newspaper accounts contained in Table 14-1 relate few economic details of floodwater damages. However, it is evident that many of the floods were of a substantial nature. It is interesting to note that some of these damages are of a non-recurring nature. For example, when a bridge or culvert has been destroyed by flooding, the structure has been replaced by one having additional capacity and thus capable of discharging high flood flows without damage to the structure. However, in a number of instances, flooding is of a recurrent nature and structural measures are required combined with flood plain zoning to alleviate this problem in the future.

2. RURAL

Flood damages in the rural areas are associated chiefly with road and bridge structures, soil erosion and sediment deposits. When floods occur, large volumes of soil are eroded from cultivated fields and pastures. These fine particles are carried to the neighbouring streams or deposited in other fields, resulting in crop damages. This process occurs in a number of areas in the Lower Trent Region.

The indiscriminate operation or non-operation of dams may also result in floodwater damages. The sudden release of water without alerting downstream interests may result in significant floodwater damages and possible loss of life. The locations of the many small dams and reservoirs in the Lower Trent Region are indicated in Figure 5-1. Floods resulting from the failure of a dam are often disastrous and for this reason special consideration should be given to the operation and maintenance of existing dams.

3. URBAN

There is no evidence to indicate that floods have increased in recent years, but there is no doubt that flood damages have increased. Flooding may be attributed primarily to the failure to acknowledge that every stream has a flood plain. In urban areas flood plains are being increasingly encroached upon, in spite of the disadvantages which include the incurring of flood damage costs or alternatively the implementation of costly flood control works to alleviate the damages.

Flood plain development has advanced in Frankford and Hastings to the stage where channel improvements are required. It is estimated that the occurence of the 1-in-50 year flows indicated in Table 14-2 would result in direct and indirect floodwater damages in the order of $100,000 at Frankford and at Hastings. There would also be the threat of loss of life under these flood conditions.

Flood plains are also present in many of the other urban areas in the Lower Trent Region, but development has not reached the critical stage where flood control improvements are necessary. However, these areas should be zoned to restrict buildings or allow only such development as can tolerate flooding without undue damage. These areas include the communities of Brighton, Colborne, Stirling, Campbellford and Trenton. Streamflows for various return periods for a number of these streams are contained in Table 14-2.

Table 14-1

HISTORY OF PAST FLOODS

Date	Location	Source of Information	Extent of Damage
Apr. 29, 1852	Cold Cr. Cramahe Twp. & Frankford	*Globe* - Toronto	4 people drowned.
Feb. 17, 1857	Brighton	*Toronto Leader*	Railway embankment washed out.
Apr. 18, 1862	Colborne & Lakeport Cr.	*Globe* - Toronto	Railway bridge embankment washed out.
Apr. 20, 1870	Campbellford Trent River	*Globe* - Toronto	Trent higher than ever before two sawmills swept away, factories, shops flooded
Apr. 23, 1870	Hastings Trent River	*Globe* - Toronto	Flood is very great; water 2 ft. higher than ever known before. Most of town under water.
Apr. 27, 1870	Campbellford Trent River	*Belleville Intelligencer*	All extensive factories rendered useless. Government work all destroyed as far as Healey's Fall
June 3, 1889	Twps. Alnwick, Haldimand, Hamilton	*Globe* - Toronto	Trace of desolation behind flood. Dams, roads, railways washed out.
Apr. 12, 1904	Frankford	*Globe*	East span of Frankford Br. carried away, cost $40, 000
Mar. 13, 1936	Brighton	Toronto - *Globe*	Brighton CPR Line washed out.
Mar. 28, 1950	Frankford	C. N. R.	300 ft. of railroad washed out.
Mar. 14, 1952	Trenton Mayhew Cr.	*Trenton Courier—Adovocate*	9 ft. depth of creek, 20 homes affected, road under water.
Mar. 1, 1955	Trenton Trent River	*Trenton Courier—Adovocate*	Flooding on West St. , North Market St.
Apr. 6, 1956	Frankford Cold Cr.	*Globe & Mail*	Flooded business district, 3 ft. of water on Hwy. 33.
Feb. 8, 1957	Frankford Cold Cr.	*Trenton Courier—Adovocate*	Water in several basements over Hwy. 33.

Table 14-2

PEAK STREAM FLOWS AND RECURRENCE INTERVALS FOR VARIOUS STREAMS

Stream	Drainage Area Sq. Miles	Peak Stream Flow in c. f. s. * for Recurrence Interval			
		1 in 25 years	1 in 50 years	1 in 100 years	+Hurrican Hazel
Cold Creek at Frankford	99. 3	2, 600	4, 000	5, 620	24, 000
Hastings Creek at Hastings	4. 8	380	810	1, 040	2, 700
Butler Creek at Brighton	8. 43	860	1, 010	1, 600	4, 550
Lakeport Creek at Colborne	5. 53	580	975	1, 400	3, 115
Mayhew Creek at Trenton	13. 8	370	550	1, 570	7, 600
Campbellford Creek at Campbellford	16. 3	540	780	1, 750	8, 600

* Cubic feet per second

\+ Hurricane Hazel flow is the flow that would be obtained if the Hurricane "Hazel" storm which struck Toronto in October 1954 occurred over the drainage area.

Cold Creek in flood at Frankford in 1957.

stantial floodwater damages will be incurred if a
or flood occurs on this stream at Hastings.

A wise use of the flood plain for park purposes at Colborne.

Section 15
EROSION DAMAGE

1- FIELD EROSION

Soil erosion is the displacement of soil particles by water by wind; and the degree degree of erosion is dependent upon many factors, some natural while others are due to man's cultivation practices on the soil.

Soil structure and porosity are important physical characteristics when the soil is subjected to heavy water runoff or to blustering winds on exposed slopes. Fine-particle soils are quite susceptible to displacement when subjected to the impact of raindrops during heavy rains, especially when these soils lack adequate vegetative cover. The rate of erosion can be affected by the time and pattern of the rainfall itself in that intense rainfall over a short period on unprotected soil may cause serious soil losses. When the surface soil is soft and the sub-soil till frozen, heavy spring rains can be particularly damaging.

The length and degree of slope also influences the amount of erosion that may take place. The steeper the slope, the more rapid the runoff, furthermore, larger soil particles become erosive. The presence of soil cover in the form of stubble or other plant material can reduce the erosive power of rainfall or runoff on cultivated fields. Grain crops give the soil partial protection from erosion, while row crops give only comparable protection at their maximum development stages. Row crops provide no protection at soil preparation, planting and early growth stages.

To reduce erosion hazards, crop rotations should be considered that include sod forming crops, as this approach will assist in maintaining an aggregated porous structure as compared to the restricted porosity of soil that has been continually crop-cultivated.

Poor tillage methods contribute to soil erosion by such means as cultivating up and down slopes, lack of maintaining field edges or the encroachment of ploughing along ditch slopes, gullies or valley slopes. Lack of planning headlands upon the commencement of ploughing fields or the establishment of up-slope dead furrows are often the initial contributors to rilling and gullying on cultivated fields.

Areas where erosion is either a problem at present or will obviously become a problem in the Lower Trent Authority were mapped during the survey. The following are the field erosion types that were noted:

a. *Sheet Erosion*

This is the initial and most subtle phase of erosion, as it often proceeds without little attention as no outstanding surface markings are apparent. Perhaps the most serious type of top soil erosion is achieved by sheet erosion, since the top soil contains most of the readily available plant nutrients and organic matter.

b. *Rill Erosion*

Rills are a concentrated form of sheet erosion, appearing as small furrows on sloping cultivated fields. The rills are a result of more rapid movement of water, thus increasing its erosion effect.

c. *Gully Erosion*

As the volume and velocity of the runoff water increases, the cutting action within the rills eventually reaches a point where gullying becomes apparent.

Areas of prominent field erosion are listed in the appendix.

Erosion can reduce crop yields. It also results in the deposition of moved soil material onto other lands, the filling in of reservoirs, an increase in flood potential because of more rapid water drainage through gullies, pollution of streams, silting of ditches and clogging of drainage systems.

2. Stream-bank Erosion

Stream-bank erosion is prevalent in various forms on the banks of numerous streams in the Lower Trent Authority, and the location of these erosion forms have been mapped.

Stream-bank erosion is found where the soil is exposed and subjected to the erosion activity of flowing water in a stream. A fluctuating water level in the river can often leave rather extensive areas of exposed bank for further erosion activity. If the velocity of streamflow is relatively fast, a form of undercutting or slumping of the stream bank may result. Erosion of stream banks and slope erosion in pastures may be caused by the grazing of livestock.

Cattle may over-graze the thin grass cover on pasture slopes, exposing the soil and contributing to stream-bank erosion by the treading of stream banks to obtain drinking water. This latter aspect is quite prevalent along streams in the Authority. It should be noted that not only are these stream banks deteriorated, but the resulting deposition of bank material into adjacent waters can create silting and sedimentation problems.

Various forms of stream-bank erosion are as follows:

a. *Slumping*

The downward movement of stream-bank material due to the outward movement of material at the toe of the stream bank.

b. *Undercutting*

The undercutting of the lower portion of a stream bank by a stream with the upper portion of the bank left intact in the form of an overhanging cliff.

c. *Cattle Erosion*

Stream-bank collapse or displacement due to the treading of domestic stock along stream banks.

To eliminate or reduce the incidence of stream-bank erosion, methods of bank stabilization should be considered by means of vegetative cover or mechanical structures.

3. Shoreline Erosion

The banks along the Lake Ontario shoreline were surveyed to determine the extent of bank erosion that may have occurred. In many locations the bank is either too low or limestone bed-rock lies close to the surface, hence the state of erosion is

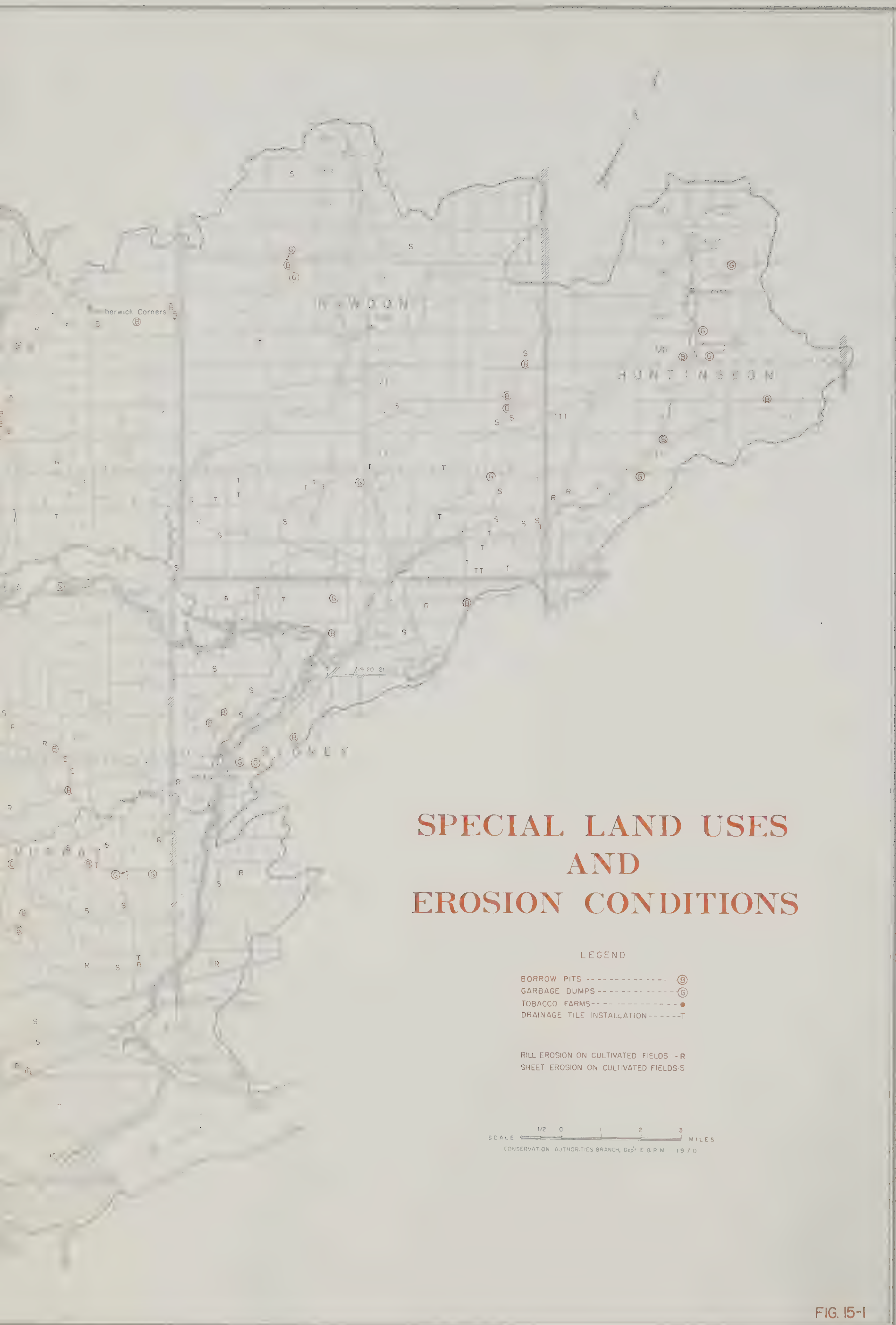
Sheet, rill and gully erosion have developed in one growing season on this cultivated field.

Advanced stages of rill erosion on a field lacking a protective cover crop.

Extensive sheet erosion on fine textured soils can reduce the productivity of cultivated farm lands.


SPECIAL LAND USES
AND
EROSION CONDITIONS
LEGEND
MURRAY
BRIGHTON

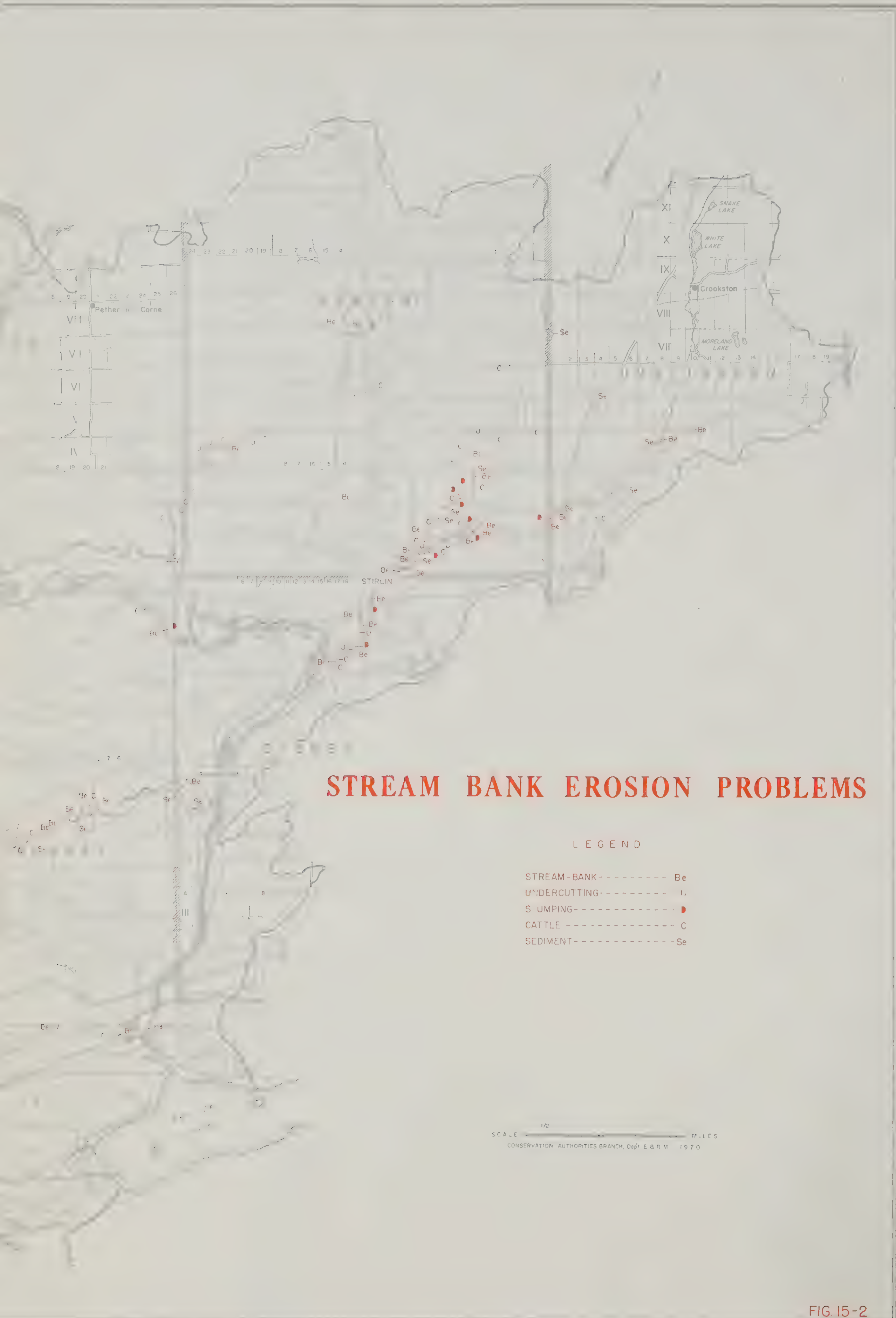
FIG 15-1



SPECIAL LAND USES AND EROSION CONDITIONS

FIG. 15-1

FIG. 2



Crookston
SNAKE LAKE
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STREAM BANK EROSION PROBLEMS
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SCALE 1/2 MILES
CONSERVATION AUTHORITIES BRANCH, Dep't E & R M 1970

FIG. 15-2

rather limited. In locations where the bank is of considerable height, erosion is prominent as, for example, in the high bank found below Grafton. The gravel bars, in some locations, provide some protection to the shoreline.

Shore erosion is a natural process, unpredictable as to severity and timing, and therefore considerable foresight is required to regulate building and provide a safety zone along steep shorelines.

4. Wind Erosion

Soil erosion by wind action, often resulting in "blow-outs," occurs on the higher higher exposed elevations. This is especially evident where the soils are exposed due to lack of vegetative cover resulting from over-grazing by livestock.

During the survey, the wind-eroded locations were found to be concentrated in the south-western segment of the Authority; in particular around the tobacco growing areas of Haldimand and Cramahe townships. Due to the susceptibility of the sand and sandy-loam soils found in this locale, some means of retarding soil displacement by wind action should be implemented. In some instances, efforts have been taken, either in the form of windbreaks or as tree plantations. The latter not only serves as a windbreak, but can also utilize sloping lands that are marginal for agricultural purposes.

The soil now covered by the Northumberland County Forest, which was subjected to extensive wind erosion, is now stablized by the reforestation program. However, erosion has taken place on the ski area in the County Forest, adjacent to Highway 45, due to the lack of vegetative cover on the slopes.

5. Special Erosion Studies

A few outstanding occurrences of soil erosion on cultivated fields were studied during the entire growing season of 1969. These examples include situations where methods of cultivation, crop rotation or field slope conditions were not given sufficient consideration by the farm operator, and serious rilling and gullying conditions developed during one growing season.

Brief descriptions of two erosion sites follow and are illustrated in photographs.

Site Location	Date of Inspection (1969)	Field Condition	Type of Erosion
Brown Corners Site (Lot 31, Con.6 Cramahe twp.)	April 22	Corn stubble evident from 1968 crop year. Rows were planted down slope.	Extensive sheet and rill erosion on sloping field due to heavy run-offs in the fall and spring.
	May 20	Field re-cultivated down slope and planted with mixed grain. Old erosion depressions have been obliterated.	New sheet erosion and minor rills are evident.

Site Location	Date of Inspection (1969)	Field Condition	Type of Erosion
Brown Corners Site (Lot 31, Con. 6 Cramahe twp.)	July 22	Erosion damage evident with considerable soil deposition in the low wooded area at the edge of the field. The catch of spring grain is very sparse in this low area of the field.	The rills are extensive and attaining minor gully stages. Some rills are from 10" to 14" in depth and 8" to 12" in width.
	August 19	The grain crop has provided some protection to the soil.	Established rills now vary in depth from 12" to 18". Boulders of the C-horizon are evident in the bottom of some rills.
	Sept. 3	Grain has been harvested, consequently the wheeled equipment has obliterated the major rills.	Depressions left by previous rills will encourage future erosion.
Dundonald Site (Lot 23, Con. 5 Cramahe twp.)	April 22	Corn planted 1968, with rows running down a steeply sloping field.	Extensive sheet erosion with off field deposition of soil.
	May 20	Corn planted 1969 across the slope but not on true contours. Insufficient headland left during cultivation.	New sheet and rill erosion evident.
	July 22	Stunted growth apparent in some corn stalks.	Major rills becoming apparent with depths varying from 8" to 12".
	August 19	Two rows of corn have been washed out.	Off field deposition of soil is extensive. A gully has attained a depth of 27" with a width of 14" across.

6. Logging and Erosion

Examination of currently logged woodlots in 1969 revealed a relatively low incidence of actual erosion caused by these operations (9.7 per cent). In all cases the damage was caused by the deliberate crossing of small streams in woodlots by wheeled skidders or tractors in the course of log removal. This erosion, although limited in extent, was also coincident with clear-cutting operations in which proper slash disposal was absent, and where no care was taken to create suitable conditions for unimpaired growth of future tree regeneration.

A somewhat greater incidence of potential erosion hazard (24.3 per cent) was found due to ground exposure by skidroads close to streams and on sloped logging sites.

Where farmers harvest their own woodlots, careful skidding with tractors in selectively cut low lying areas, has served to reduce the potential for silting and sheet erosion. Judging by the logging sites observed, the locations of skidroads were not deliberately chosen to avoid the erosion hazard, but because the areas were so wet that there was a danger of traction loss to machinery. However, regardless of whether this relationship between local skidding trails and erosion hazard is coincidental or not, the possibility of greater care in logging methods is apparent. One practice that should be discouraged is the tendency to allow livestock to graze cut-over areas, since this is detrimental to post-cut regeneration and increases the hazard of sheet erosion.

7. Effect of Plantations on Forest Soil Erosion

Much planting is on slope or hill-top locations where it provides erosion control. Many plantations have now reached the stage where litter dropped by the trees, is providing noticeable assistance in keeping soil conditions stable, but only within the plantation areas themselves. Observations in 1969, however, also show that considerable assistance is given to this erosion control function by natural grass cover and other forms of ground vegetation. Some sheet and gully erosion is still evident, usually caused by runoff from upslope non-forested lands. In the case of a few gullied situations, reforestation alone will not provide sufficient control, and simple structures may be needed within the plantation and the gullies.

A specific comparison between wooded and cultivated areas is given in the Appendix.

8. Wind Erosion and Trees as Shelter

The lighter soils, particularly in the tobacco growing areas, are subject to wind erosion. Wind also causes losses to crop, drifting of snow and increased expense in operating feed lots and heating buildings. Windbreaks, shelterbelts and natural woodlands, where properly located, may reduce such losses considerably.
erably.

While some land owners in the Authority were using trees effectively for these purposes, many were unconvinced and failed to manage properly even those windbreaks which did exist. Much of this apathy is due to ignorance of proper design, location and management of trees or other shelter crops. These matters are discussed in some detail in the Appendix for the guidance of the Authority in promoting wind protection measures.

Slash as shown here can retard tree regeneration and obstruct stream flow.

Woodlot provides shelter for a cattle feed-lot operation.

Crossing stream-beds with heavy construction machinery can initiate unnecessary stream-bank erosion problems.

Section 16
SEDIMENT DAMAGE

The majority of streams within the Lower Trent Region flow through glacial landforms generally overlain with medium to fine grained soils, some of which have the characteristics of wind deposited silt or loess. These soils are easily transported by fast moving streams resulting in the streams carrying heavy loads of eroded soil. This would occur primarily in the spring and after peak runoff events. The soil particles are carried in suspension by the stream until the transporting power of the stream is diminished by flowing into quieter waters such as encountered at a pond or reservoir. As the suspended solids settle out in a reservoir, the storage capacity of the reservoir is reduced, resulting in a shorter useful life of the reservoir.

In the Lower Trent watershed an estimate of the sediment transport by the streams and an estimate of reservoir silting was obtained. The volume of sediment in ponds and reservoirs was estimated by measuring at various locations the depth of silt in the reservoir to obtain the estimated quantities of sediment tabulated in Table 16-1. This table indicates that the greatest reservoir silting has occurred at Norham and Dartford, on Salt and Percy Creeks respectively.

Suspended solids in the streams were measured as part of a continuous water sampling and analysing program during the summer of 1969. Analyses were carried out at the laboratories of the Ontario Water Resources Commission and also by Conservation Authorities personnel at the Loyalist College Laboratory in Belleville. Table 16-2 lists the recorded results for suspended solids in various streams. It is noted that Salt Creek would probably, on the average, carry the greatest amount of suspended solids. Butler Creek had the greatest recorded sediment load during a peak flow occurrence following a rain storm. The waters of Squire Creek are relatively free from suspended solids.

Damages arising from sedimentation are multi-fold. Silt has to be removed from municipal ditches and farm drains in order that these facilities function properly. Additional material has to be placed at bridges and culverts and in some instances on farm fields where material has been eroded. The turbid waters of a stream are aesthetically unpleasant and reduce the recreational potential of an area. Pipe inlets installed in streams for irrigation and urban and rural water supplies become clogged with silt, thereby involving costly maintenance work. Decreasing depths of reservoirs due to sediment accumulation encourage vegetative growth and these reservoirs require periodic dredging at considerable cost.

Table 16-1

ESTIMATED QUANTITIES OF SEDIMENT IN SELECTED PONDS AND RESERVOIRS

Name of Reservoir	Location	Stream	Reservoir Surface Area Ac.	Sediment Min. Ft.	Depth Max. Ft.	Estimated Quantity of Sediment Cu. Yds.
Stirling Pond	Stirling	Rawdon Creek	10.33	1.5	* 7.0	70,800
Norham	Norham	Salt Creek	21.81	3.0	* 9.5	220,000
No Name	Lot 31, Con. X, Cramahe	Salt Creek	2.52	1.0	3.5	9,150
Nor-Gil Devel.	Lot 4, Con. VII, Haldimand	Salt Creek	2.85	Nil	Reservoir recently constructed	
No Name	Lot 16-17 Con. IV, Percy	Percy Creek	4.82	2.7	4.5	28,000
Dartford Pond	Dartford	Percy Creek	43.04	3.0	*	312,000
Frankford	Frankford Village	Cold Creek	10.56	0.7	3.8	38,300
Stockdale	Stockdale	Cold Creek	25.48	0.1	3.8	80,200
Mutton's Mill	Lot. 18, Con. VI, Cramahe	Cold Creek	0.92	4.0	7.5	8,500
Brown's Corner	Lot. 32, Con. VI, Cramahe	Cold Creek	8.38	1.4	4.1	37,200
Castleton	Lot. 34, Con. VII, Cramahe	Cold Creek	4.25	3.0	* 7.0	34,300
No Name	Lot. 35, Con. VI, Cramahe	Cold Creek	1.26	1.4	2.7	4,160
Warkworth	Warkworth	Mill Creek	2.41	0.3	5.5	11,300
Bowen's Mill	Lot 13, Con. III, Percy	Mill Creek	2.98	2.5	*11.0	32,400
Ferguson's Dam	Lot 13, Con. VIII, Haldimand	Mill Creek	19.97	1.0	3.6	74,100
Smithfield	Smithfield	Smithfield Creek	0.69	2.4	5.6	4,450
Salem Corners	Salem Corners	Salem Creek	4.25	1.0	8.2	31,500
Mirror Lake	Lot 23, Con. I, Cramahe	Salem Creek	3.33	0.3	2.8	8,320
No Name	Lot 21, Con II, Cramahe	Salem Creek	0.92	3.9	10.3	10,500
No Name	Lot 4, Con. I, Alnwick	Stone Creek	15.84	1.5	4.7	79,200
Sneath's Pond	Lot 26, Con. II, Haldimand	No Name	1.95	5.3	8.2	21,200

* Maximum depth not recorded

Silt accumulation in Norham pond.

Sediment periodically clogs the water intake at this dam on Salem Creek. Water is used to power a small downstream mill.

Build-up of silt in reservoir on Salt Creek in Lot 31, Concession X. Township of Cramahe.

Table 16-2

SUSPENDED SOLIDS P.P.M.*

Stream	Maximum Measured	Minimum Measured
Squire Creek	1	1
Rawdon Creek	80	5
Salt Creek	61	25
Percy Creek	31	1
Cold Creek	40	1
Mayhew Creek	15	10
Mill Creek	40	5
Smithfield Creek	88	6
Butler Creek	*903	1
Lakeport Creek	+204	5
Shelter Valley Creek	+ 94	5

* Parts per million of volume

\+ Samples taken during peak flows after heavy rains on July 4, 1969.

Section 17
INADEQUATE LOCAL DRAINAGE

1. TILE DRAINAGE SYSTEMS

The advantage of drainage tile systems for soil improvement for agricultural purposes are well known. Improved field drainage provides the following benefits: 1) root penetration increases and hence the plant has greater access to free water during dry periods; 2) fields dry earlier and farmers are able to work the fields early in the season; 3) soils warm up sooner; and 4) soil bacterial action increases to improve the fertility of the soil.

In the Lower Trent Authority, tile drainage systems have been installed in several farming areas to rectify drainage problems associated with the heavier soils. In particular, some farms on the clay plains north-east of Percy Reach and in the southern portions of Rawdon and Huntingdon townships have these systems to lower the high moisture content of the soil. In other areas, some farms have small acreages under drainage tile in stony or cobbly type soils. With these soils there is some difficulty in laying the tile, consequently installation costs are higher.

Recent introduction of manufactured plastic tubing for drainage systems has received some acceptance by the farmers in the Authority. Apparently, the use of this piping material requires less labour and installation time is reduced.

The extent of tiling systems has been rather limited to specific soil types; and the present tiled acreages are rather small within the Authority. Several farmers mentioned that they would like to or should tile some of their acreages to improve drainage problems.

To establish a sound tile drainage system on a farm, appropriate drainage studies and planning are involved; furthermore, the outlet of these drainage systems should be carefully considered. Improperly constructed outlet of tile systems to a stream or drainage ditch can create potential soil erosion problems. This latter point is often given little attention during the construction phase, and in some instances stream-bank deterioration as well as sedimentation problems can arise.

2. GRASS WATERWAYS

A grass waterway is a drainage ditch with gradual sloping sides in which have been planted suitable grasses for vegetative cover. In essence, the function of a grass waterway is to walk the water down sloping fields which are susceptible to erosion.

Due to the rolling topography present throughout most of the Authority, natural water courses often transect cultivated fields. If the runoff is excessive at any one time, or the slope of the field is rather steep, the cutting action of the flowing water can establish prominent gully features in the landscape.

During the survey the locations of potential grass waterway sites were mapped, in addition to existing grass waterways that were situated in cultivated fields. The following table indicates locations where grass waterways could be utilized:

Table 17-1

POTENTIAL GRASS WATERWAY SITES

Township	Lot No.	Conc. No.
Alnwick	Lot 6, 10	Con I
Brighton	Lot 35, 36	Con VII
	Lot 23, 24	Con IV
Cramahe	Lot 11, 13	Con IX
	Lot 21, 20	Con IV
Haldimand	Lot 6, 7, 8	Con I
	Lot 12	Con IV
Huntingdon	Lot 4, 5	Con VIII
Murray	Lot 7, 8, 9	Con VII
	Lot 2, 3	Con VII and VIII
	Lot 12, 13	Con I
Percy	Lot 21, 22	Con V
	Lot 17, 18	Con II
Rawdon	Lot 18, 19, 20	Con III
	Lot 5, 6	Con VII
	Lot 19, 20	Con VII
Sidney	Lot A, 1	Con VII

Section 18

WATER SHORTAGES

1. AGRICULTURAL CROPS

The shortage of water for crop irrigation purposes is relatively minor and occurs in a few isolated areas of the Authority.

Sufficient water is available to many farmers by means of the numerous streams and creeks situated within the Authority. During the farm surveys, the greater proportion of operators indicated that the availability of water from either streams or ponds on their farms would be sufficient.

The areas which do experience water problems are the farms situated on the higher elevated drumlins and kames. Where the entire farm holding lies on top of these higher landforms, then an adequate, all season water supply could be a problem, especially during drought periods. Often deep wells are not adequate and hence the farmer may have to resort to hauling water during dry spells. Two specific areas which may experience insufficient water quantities are: 1, farms along County Road 62 in Percy township, and 2, east of Dundonald in Cramahe township. In these areas some farmers have resorted to hauling water for irrigation and domestic purposes.

If the present limited demand for irrigation water should increase, then the numerous ponds and streams that farmers have taken for granted may not be adequate to handle the demand for water.

2. LIVESTOCK AND RURAL DOMESTIC

The general concensus among the farm operators is that there are adequate water sources for livestock purposes on the individual farms. The practice of impounding water from streams flowing through farm properties for livestock watering holes is common. This practice does contribute to stream-bank erosion and possible stream pollution. More attention by the farmers is required in order to maintain a better water quality throughout the stream course system.

On many of the farms, the utilization of a two-water-well system is common: one well for livestock needs and the other for domestic purposes. Most farmers stated that their water-well systems were adequate for their present requirements.

3. MUNICIPAL AND INDUSTRIAL SUPPLY

Water consumption rates and sources of supply for the various municipalities with installed water distribution systems were summarized in Section 5 of the Report. No detailed investigations were carried out during the survey systems, but no water shortages were evident.

4. RECREATION

Water shortages seldom affect recreational activities in the Lower Trent Region Conservation Authority.

The flow of the major water resource, the Trent River, is controlled to a great degree by the Department of Transport and the Ontario Hydro-Electric Power Commission so as to maintain pleasure boat navigation and electric power supply.

The operation of dams and locks occasionally results in periods of low-flow along certain reaches of the river, especially south of Campbellford, where fishing and boating are sometimes restricted, particularly off the main navigation channel. A number of fish kills just below the dam at Hastings have been attributed to the fact that water is diverted from the main channel, to operate the locks, thus cutting off the flow of water over the dam and trapping fish in restricted pools. The Department of Lands and Forests is reportedly considering steps to alleviate this problem.

Water shortages, especially in the late summer, affect the fishing in certain areas of the Authority.

The periodic fluctuations in levels of Lake Ontario may pose some short term difficulties to cottagers along the shoreline, but in many cases these have been overcome through the use of extended floating docks, or dug channels.

Apart from these instances, the area seldom experiences an insufficient quantity of water for recreational purposes.

5. FIRE PROTECTION

Fire protection is an important function of a water distributing system. In most cases the design of water mains, pumps and reservoirs is determined on the basis of requirements for fire protection. The ability of existing municipal water distribution systems to meet fire protection requirements was not investigated during the survey.

Water is also required for fire protection in rural areas where it is not presently economically feasible to install a waterworks system. In these smaller communities, there is a need for the construction of small reservoirs or community ponds for fire protection purposes.

6. LAKE LEVEL FLUCTUATIONS

As noted elsewhere in this Report, the major surface water source in the Lower Trent Region is the Trent River and Canal. The regulation of the Trent Canal with regard to fluctuations in water levels, is the responsibility of the Canal Services Branch of the Canada Department of Transport.

Regarding other lake areas, cottage development has concentrated around two lakes, Biddy Lake and Oak Lake. The remaining lakes in the region are fairly small and cottage development around these lakes is fairly sparse or non-existent. With respect to Biddy and Oak Lakes, no problems with lake level fluctuations became apparent during the survey. However, problems may occur when summer precipitation is below average and evaporation losses are high.

Section 19
POLLUTION

There are three main types of pollution in the Trent River system. These are as follows:

1) Bacterial pollution affecting human health. This is measured by the number of coliform bacteria (or alternatively fecal coliforms) per 100 millilitres (ml.). The fecal coliform counts are a more recent addition to the method, and are only just coming into use. Coliform counts of over 2,400 per 100 ml. indicate water not suitable for swimming.

2) Toxic pollution upsetting the animal life of a stream, affecting fish, wildlife and possibly human health. These most commonly come from factories, including cheese factories. Besides being toxic, these may and often do raise the Biochemical Oxygen Demand (5-day BOD) to the point where microscopic fauna, insects and other small invertebrates cannot live.

3) Over-enrichment or eutrophication. This is the condition where too much phosphorus and nitrogen and certain trace elements are in the water, causing algal blooms and dense mats of large algae and aquatic vegetation to grow in water, affecting navigation, swimming and (chiefly at night) withdrawing oxygen from the water. High nitrates and phosphates occur in water particularly from tanneries and from the use of household or industrial detergents. Phosphorus is generally considered to be the limiting element in the development of nuisance growths of algae and woods. Some forms of algae can take nitrogen directly from the air, while phosphorus can be obtained only from the water.

It should be stressed that measurement of nitrates is not of much use as a measure of enrichment of water except when the concentration is very high, at least higher than one part per million, because phytoplankton take it up in daytime and do so more on bright days than on dull days.

There are other types of pollution affecting either the taste or appearance of water. For example phenol in very low concentrations of two parts per billion imparts an unpleasant taste to water, and may taint the flesh of fish.

The symbol pH indicates the acidity or alkalinity of the water. Although the Ontario Water Resources Commission suggests that the pH of water should not be less than 6.7 or greater than 8.5 (7.0 is neutral), in practice it has been found that fish are extraordinarily tolerant of variations of pH. Only strong acid or alkaline solutions affect them.

The Trent River and Rice Lake

In dealing with the conditions of pollution and eutrophication of the Trent River from Rice Lake to the Bay of Quinte a special situation is encountered, because the river even in Rice Lake is already showing the effects of overfertilization and pollution originating in Peterborough and in many lakes on the Trent system above Peterborough.

Turbidity is not always an indication of pollution as it may be caused by strong winds, or by motor boats, or by an abundance of carp. However it is of

interest to note the turbidity of Rice Lake as measured in 1969 and that of other lakes higher up in the Trent system.

Balsam Lake ..... 0. 8 Silica Units
Cameron Lake ... 1. 0 Silica Units
Pigeon Lake ..... 2. 0 Silica Units
Buckhorn Lake ... 1. 7 Silica Units

The above measurements were made in August, 1963, on a calm day. On similar days in Rice Lake the measurements averaged as follows:

1961 ..... 2 Silica Units
1964 ..... 4 Silica Units
1968 .....10 Silica Units

In 1969 the lake was extremely turbid through the middle and late summer. Its fertility was obvious from the dense mats of algae and higher aquatic plants. Several water samples examined by biologists from Trent University showed large quantities of blue-green algae mainly of the genera *Microcystis and Anabaena.*

Twelve samples were taken of the water of Rice Lake for bacterial tests during the summer of 1969, and later examined at the laboratories of the Ontario Water Resources Commission. All showed coliform bacteria varying in amounts from a minimum of 8 to a maximum of 700 coliform bacteria per 100 ml. These results suggest that while the water of Rice Lake is unfit for drinking, it is well below the maximum allowed for swimming, which is 2, 400 per ml. There may be, and probably are, isolated cases of bacterial counts affecting swimming.

In July, 1969, many of the beaches were so spoiled by weeds and algae that swimming was unsatisfactory or dangerous. This condition continued through the rest of the summer.

Sampling of the phosphate phosphorus (its most available form) in the Trent River by staff of the Department of Biology of Trent University has shown a rapid rise in phosphorus below Peterborough. The station sampled was at the mouth of the Otonabee River in Rice Lake. Most of this phosphorus appears to be taken up by phytoplankton and higher plants in Rice Lake, as the concentrations are lower below Trent Bridge. At the time of writing of this report, the data had not been subjected to statistical analysis.

There was a second rise in available phosphorus at another point examined, below Hastings, and a further increase north of Batawa. There is an urgent need for additional and more frequent sampling of the available phosphorus and available nitrogen content of the Trent River during the growing season for aquatic life, in order to give more emphasis to the deductions already made, or to refute them.

The evidence so far available (from the Department of Biology, Trent University) is shown in the following table.

e dense mass of vegetation at the southern edge of Percy's Reach (on the Trent River) attracts wildfowl, but makes swimming impossible.

vast mass of the Murray Marsh as seen from a drumlin to the south-east.

Table 19-1

PHOSPHATE-PHOSPHORUS

Location	Microgram atoms per litre Mean of high readings	Mean of low readings
West end of Rice Lake (Bewdley)	.35	.3
Mouth of Otonabee River	.45	.3
East of Rice Lake (above Hastings)	.2	.1
Trent River below Hastings	.45	.3
Above Batawa	.7	.5
In the Bay of Quinte (Station Q2)	.5	.3

REACTIVE NITRATES

Location	Microgram atoms per litre Mean of high readings	Mean of low readings
West end of Rice Lake (Bewdley)	.5	.3
Mouth of Otonabee River	1.6	.2
East of Rice Lake (above Hastings)	.5	.4
Trent River below Hastings	2.6	.6
Trent River above Batawa	3.2	.7
Bay of Quinte (Station Q2)	6.2	.9

The discharge of the Trent River is affected by the regulation of the flow at the Hydro dam at Healey Falls. However, the river has not had a mean monthly discharge of less than 1,000 cubic feet per second at Glen Ross since 1963. From this fact it might be expected that a river as large as this one, coming from many lakes on the Canadian Shield, would be a very important purifier of the water of the Bay of Quinte. However, the actual improvement of the quality of water in the bay is rather slight, according to work carried out by M. G. Johnson. This presumably results from the pollution and eutrophication which occurs at Hastings, Campbellford, and Trenton and perhaps from the very large numbers of cottages built along the riverside. For example there are about 450 cottages on the riverbank in the area from Campbellford to Frankford alone.

Hastings

The tannery at Hastings lies outside the boundary of the Lower Trent Region, but its effluent must affect the waters of the Trent River which are within the Region. The effluent no doubt increases the Biochemical Oxygen Demand of the river.

Of 95 samples of Trent River water sampled at Hastings (Dents Cottages and High-Lo Cottage Dock) from December, 1965, to September, 1969, six contained coliform bacteria above the limit allowable for swimming. Of these samples two were taken in June, two in July and two in August, i. e., at times when the river might be used for swimming. These areas were sampled on the average once or twice per month, and it is clear that the sampling procedure should be repeated more frequently during the summer months. Until the river's condition

is improved, it should not be used for swimming. It is presumed that at other times the counts may have been higher than the maximum of 7,000 coliforms per 100 ml. actually counted during the tests.

Campbellford

Bottom fauna were collected in the Trent River above Campbellford and also at various "stations" where the river passes through the town. The fauna from above the town was similar to the fauna found in an unpolluted stream, except that no mayfly nymphs were found. However caddisflies typical of clean streams were present in large numbers.

In the town itself the bottom fauna characteristic of an unpolluted stream were no longer present and *Tubifex* (the sewage worm) was found in large numbers below the old treatment plant and the cheese factory. The water of the Trent River is apparently polluted severely even above the effluent of the tannery.

Campbellford Dam

Coliform bacteria counts made in 1968 and 1969 at the dam at Campbellford showed extremely high coliform counts. Nine results out of 20 samples made in 1967-8 showed coliform counts in excess of one million coliforms per 100 ml. The highest estimated count per 100 ml. was 89 million on May 8, 1968. Counts made in 1969 exceeded 10,000 coliforms per 100 ml. on eight occasions out of 11 samples, and exceeded 25 million coliforms per 100 ml. on three of these occasions. This represents a very high degree of bacterial pollution.

Breithaupt Leather Company at Campbellford

This plant tans cattle hides for soft leather goods. There are the usual operations of bating, chrome tanning, dyeing and finishing.

Process water is obtained from the Trent River. Water usage is estimated at 17,000 gallons per day. Liquid wastes are conveyed to a settling tank, and from the settling tank the wastes are discharged to the Trent River.

Waste Loadings		To Trent River	
	1966	1967	1968
5-day BOD, lbs. per day	420	42	103
Suspended Solids, lbs. per day	480	98	120
Chromium, lbs. per day	190	49	22
Waste volume, gallons per day	200,000	15,000	17,000

This company has recently received approval from the Ontario Water Resources Commission to precipitate and settle chromium from the wastes by pH adjustment with lime. A water sample taken by the survey party on August 13, 1969, in the Trent River below the outlet pipe of the Breithaupt Leather Company showed normal characteristics except that it contained 800 parts per billion of phenol. Two parts per billion of phenol imparts an unpleasant taste to water, so that a count of 800 parts per billion must be considered very severe pollution.

In seven Kjeldahl nitrogen samples of a total of 20 samples taken in 1967-8 the measured nitrogenous matter (apart from that measured as nitrites or nitrates)

was above 3.00 p.p.m. and in one case was 11.00 p.p.m. The normal range for total Kjeldahl would be 0.1 to 0.5 p.p.m. This gives some measure of the high organic nitrogen present.

Stirling

The treatment of wastes at Stirling is carried out by means of two lagoons. The effluent from these lagoons appeared cloudy when examined by the survey party. A test was therefore made (Ontario Water Resources Commission Lab. No. 117656) of the water of Rawdon Creek immediately below the lagoon effluent. The coliform bacteria count was 4,000 which is unsatisfactory. A test of the water of Rawdon Creek above Stirling was also made. This showed a coliform bacteria count of 1,500 which indicates water suitable for swimming, but not for drinking, without treatment.

Frankford

This village has a waste treatment plant with primary treatment followed by a trickling filter system. No serious problems are envisaged from this area, but there is some question as to whether the trickling filter is operated satisfactorily in winter.

Bata Shoe Company

This plant is engaged in the manufacture of shoes from leather and rubber. Water required from the Trent River is estimated at 300,000 gallons per day. Cooling water is discharged to the Trent River. Large quantities of suds were discharged with the effluent, usually before 8 a.m. each weekday morning in the summer of 1969. This was not only seen by the survey party in 1969, but was also confirmed by two lockmasters on the Trent canal system. The overfertilizing effect of these wastes was seen in the exceptional growth of algae and higher aquatic plants downstream from the effluent pipe, as shown on the accompanying photograph.

No other waste disposal problems are expected from this plant.

The Trenton Paper Mill

The major source of pollution on the Trent River is the paper mill which manufactures corrugated paper from chemical pulp and waste paper at Trenton. This is a very old problem. A hearing was held at Trenton with the Original Pollution Control Board of Ontario, which preceded the establishment of the Ontario Water Resources Commission. At that time most of the wastes passed virtually untreated into the Trent River. An undertaking was then given that the wastes would be greatly reduced.

In 1968 the facilities and effluents were examined by the Ontario Water Resources Commission. From the report on this examination the following can be quoted:

> The present contaminant concentration levels in the mill effluent to the Trent River were still found to be in excess of the Commission's objectives. Also biological and water quality data collected from the Trent River above and below (the plant) indicate that the wastes are adversely affecting the quality of the watercourse.

Sources of liquid wastes are as follows, amongst others:

1. Spent cooking liquor
2. Clarified white water
3. Log chain wash water
4. Septic Tank overflow
5. Tank and pump leakage.

Spent cooking liquor is pumped to holding ponds and is used for road surfacing in the summer. The clarified white water is discharged through a partially submerged outfall to the Trent River. Also discharging to the Trent River are overflows from a septic tank. Dilution water is added to the main mill effluent immediately before its entry into the watercourse.

Waste characteristics determined from the weighted average of composite samples indicate that the effluent from the disc filter is the most serious pollutant and includes the following:

	Suspended Solids lbs./day	Dissolved Solids lbs./day	BOD p.p.m.
Effluent from Disc Filter	1,500	48,500	1,780.0
Raw River Water	63	2,200	2.7

The septic tank is situated adjacent to the watercourse. Apparently contaminated wastes resembling black liquor have been periodically observed in the overflow.

In order to determine if the wastes were toxic, independent of any biochemical oxygen demand, parallel bioassays were carried out in 1968 on large samples, one aerated, the other unaerated, using the fish species *Pimephales promelas* (the fathead minnow, a fish with considerable resistance to pollution). The unaerated bioassay showed an acute toxicity. The median tolerance limit (TLm) (concentration at which 50 per cent of the fish survive) was 57 per cent at 96 hours. The aerated bioassay was non-toxic in the same period.

The high Biochemical Oxygen Demand of the effluent presents a serious pollution problem. The mill was discharging a daily oxygen demand for 22,000 pounds of oxygen.

An attempt was made by the survey party in 1969 to evaluate the bottom fauna from above the paper plant to the Bay of Quinte. The bottom was found to be too rocky and stony for an adequate survey. Recourse was therefore made to the evaluation by the Biology Branch of the Ontario Water Resources Commission, made in 1968, when artificial substrates were used in most cases. There was an immediate and drastic reduction in aquatic invertebrates on the east side of the river below the paper mill. The only forms (taxa) found at two of the stations were larvae of midges (Chironomids) which are notoriously tolerant to polluted waters.

It is noteworthy that the river had still not recovered by the time it entered the Bay of Quinte. The numbers of kinds of taxa or forms of invertebrate life as found in the east or most polluted side of the river are shown in the following table.

This photograph shows the spraying of effluent (in order to evaporate much of it) from the Domtar operations in Trenton, on logs with a rotary sprayer. During 1969 the rotary sprayer was also spraying effluent directly on the Trent River and onto people passing in a boat. This practice is illegal.

This pipe takes the effluent from a cheese factory and passes it into Rawdon Creek. At times much solid whey passes through the pipe, falling directly into the creek.

Table 19-2

NUMBER OF TAXA OF VARIOUS GROUPS OF BOTTOM FAUNA AS DETERMINED BY SHORE-LINE QUALITATIVE EXAMINATIONS AT STATIONS ALONG THE EAST SHORE OF THE TRENT RIVER.

(Sept. 30 - Oct. 1, 1968)

TAXA	STATIONS													
	1C	2C	Effluent from Paper Mill	2Ca	3C	3Ca	3Cb	4C	4Ca	5C	5a	6C	7C	Mouth of Trent River
MAYFLIES	1	2												
CADDISFLIE	6	7											1	
DRAGONFLIES		1							1			1	1	
BEETLE LARVAE	1	2												
TRUE FLIES	3			1	1	1	1	1		3	3	2	2	
CRUSTACEANS	3	3		1					1	2	2	2	2	
SNAILS	6	4							1	2	2	4	3	
LEECHES	1	1								1	1	2	1	
FLATWORMS	1	1									1	1	1	
WORMS						1		1	1	1	1	2	1	
SPONGE		1												
TOTAL TAXA	22	22		2	1	2	1	2	4	9	10	14	12	

Data from Ontario Water Resources Commission Files

On the west side of the river there was also a reduction in the number of taxa (forms) found. This was by no means so drastic as the reduction on the east side, but the reduction continued down the river, no doubt because of various small industries on the west side of the river.

Stokeley Van-Camp of Canada Limited, Trenton

This factory is involved in the seasonal canning of vegetables, essentially peas and corn.

Disposal of Wastes: All wastes from the vegetable processing operations are pumped to a vibrating screen. Solids are collected and used as animal feed, while the screened effluent is discharged to the Bay of Quinte.

Waste Loadings:	Pea	Corn
Volume, gallons per day	180,000	300,000
5-day BOD, lbs. per day	1,430	6,000
Suspended solids, lbs. per day	1,150	2,400
Kjeldahl nitrogen, lbs. per day	169	132

Knox-Gelatine of Canada, Limited

At this plant gelatin is manufactured from bone chips. Wastes are discharged to the Bay of Quinte.

Waste Loadings:	
Volume, gallons per day	120,000
5-day BOD, lbs. per day	205
Suspended solids, lbs. per day	573

Trenton Municipal Waste Treatment Plant

The following is a summary of the salient points in a report by the Ontario Water Resources Commission staff concerning the Trenton Waste Treatment Plant. Inspection of the facilities was made on July 17, 1969.

The population of Trenton in 1969 was 13,950. As of July 17, 1969, major industries such as Trenton Cold Storage Limited, Knox Gelatine of Canada Limited, Stokeley-Van Camp of Canada Limited and Domtar Newsprint Limited, discharged their wastes to the Trent River or the Bay of Quinte. Other major industries, Riverside Dairy Products Limited, Quaker Oats of Canada Limited, Morton Parker Limited and Benedict Proctor Manufacturing Company Limited, discharged their wastes to the municipal sewerage system. Trenton Dyeing and Finishing Company Limited has recently been connected to the system.

Since January, 1968, staff of the Ontario Water Resources Commission have commented favourably on the proposed development of 682 dwelling units in Trenton. This development, if sewered, would probably result in an additional flow of about 200,000 gallons per day.

Average daily pumpage through the treatment plant had reached 2.8 million gallons per day by June, 1969. The plant was designed for a flow of one million gallons per day. In wet weather and times of heavy rain flows greater than three million gallons per day have been recorded.

The detention time of the settling tanks designed for three hours has had to be reduced to 1.25 hours. Wastes occasionally have to bypass the plant. The operator reported that bypassing occurs rarely.

It was not possible to supply proper chlorination at the plant, due to the excessive flows. Bacterial analysis of the plant effluent since May 5, 1968, has shown coliform bacteria ranging from 6,200 to 970 million per 100 ml. The calculated average chlorine dosage carried out continuously, from the 1968 records, was determined to be 3.3 p.p.m. It was therefore recommended to the Division of Plant Operations of the Ontario Water Resources Commission that the chlorine dosage be increased to 7.0 p.p.m.

It was reported that all facilities were well maintained and operated. The report concluded that expansion of the plant "is of the utmost importance."

At the date of writing this Conservation Report, the Ontario Water Resources Commission was in the process of planning with consultants for the preliminary design of a greatly expanded treatment plant under provincial financing.

There still remain the following requirements:

1. Completion of the preliminary design;
2. Submission of the design, with probable costs, to the Municipality which will have to prepare a rate structure;
3. The cost will have to be submitted to the Ontario Municipal Board, which can approve or reject it;
4. Final exact design;
5. Tenders for the work to be accomplished, and
6. Building of the expanded system.

It appears probable that it will take at least two years before the facilities are available. Meanwhile pollution of the Bay of Quinte will continue, particularly in times of high flow. The most recent developments are as follows:

The Domtar Company and the Stokeley-Van Camp Company have decided to treat their own wastes.

The Knox-Gelatine Company has decided to have its wastes passed into the municipal waste treatment plant.

BACTERIAL POLLUTION AT TRENTON

Some of the bacterial counts at the Trent River bridge on Highway 2 at Trenton since May, 1968 have been as follows:

Day	Month	Year	Coliforms per 100 ml.	Day	Month	Year	Coliforms per 100 ml.
7	5	1968	410	4	3	1969	11,600
29	5	68	9,000	15	4	69	13,800
25	6	68	5,300	17	6	69	2,900
17	7	68	370	15	7	69	5,700
7	8	68	41,000	19	8	69	13,000
22	1	69	3,300	16	9	69	2,700

The river Trent is therefore not suitable for swimming in this area, as the maximum count allowable is 2,400. This is extraordinary pollution considering the great volume of flow of the river and the fact that in general the town's sewage wastes go to a treatment plant on the Bay of Quinte. The origin of the bacteria is not known.

Other Examples of Pollution

Several houses between Highway 401 and Highway 2 apparently run their sewage raw into Butler Creek, near Brighton. One family apparently obtains its drinking water from the creek. One hotel on the south side of Highway 2 also allows raw sewage to enter Butler Creek.

A random sample taken from the creek by the survey south of Highway 2 on June 12, 1969, showed a coliform count of 3,800 per ml. The pollution is obviously much greater at other times.

The houses in Lakeport are connected by a sewer to a sewage lagoon. A sample taken in Lakeport Creek below the village, but quite apart from the sewer pipe, was tested and showed 2,100 coliforms per 100 ml. It was impossible to trace the source of this pollution. Similarly, a sample taken on Salt Creek below Norham on September 1, 1969, showed 1,400 coliforms per 100 ml. Breakaway Creek was sampled east of Highway 30, and showed 940,000 coliforms per 100 ml.

It seems that virtually all of the streams in the watershed are polluted in some degree either by cattle pollution or by pollution of human or other animal origin.

Biddy Lake (Little Lake) in Cramahe township is surrounded by many cottages. This was one of the few bodies of water in the Region with negligible pollution. Four samples taken near the shore on the four sides of the lake on September 1, 1969, showed counts respectively of less than 4, 12 and 20 coliforms per 100 ml. At that time it appeared suitable for swimming.

Two samples taken from the water in Presqu'île Marsh downstream from the municipal refuse disposal site showed respectively 900 and 700 coliforms per 100 ml. These showed 400 and 240 fecal coliforms respectively.

Many residents of Hastings empty what appears to be raw sewage into the the creek bed of Killoran Creek, near Hastings, and there is a smell of raw sewage. There are complaints of garbage, glass, cans and lumber collecting at the mouth of Killoran Creek and entering the Trent River. There is an eddy at the mouth of the creek. Dead fish were also seen here.

Brighton

The village of Brighton has waste treatment by means of a lagoon at the southeast limits of the village. There are three factories in the village. The survey party observed labourers in a factory with the name Rex Chemicals on it, dumping an effluent from a large tank at the side of the building. The effluent was not sampled or tested.

Colborne

There is a sewage lagoon at the western limits of Colborne. There is one factory with the name Saine Chemicals on it. The effluent occasionally dumped by this factory into a watercourse should be checked.

Cheese Factories

While there are many cheese factories in the Region, the only evidences of dumping of whey in a ditch or watercourse were the following:

1. The Evergreen Cheese Factory, east of Stirling, was observed dumping whey from a tank across a parking lot and into the adjacent field and stream;

2. Whey from the cheese factory at Harold, although carried across the creek by a pipe, evidently fouls a tributary of Squire Creek, since at the first bridge close by, downstream, there is a great abundance of algae suggesting very gradual recovery from pollution by whey.

Cattle Pollution

The problem of bacterial pollution is greatly aggravated by the normal habit of watering cattle in streams. For the purposes of the stream survey concerning fish and wildlife, streams in the Region were examined at more than 200 points. It was soon apparent that to assess adequately the bacterial pollution from cattle the streams would have to be sampled and the samples tested at many thousands of points, many times at each point, since cattle are moved from field to field during the summer. Pollution of running streams or temporary pools (which overflow after rains) is common and to be expected all over Ontario, and indeed all over the world, wherever cattle have access to water which can reach a watercourse. The project of assessing bacterial pollution from cattle was therefore found to be impractical.

A series of samples was taken by Mr. Paul Heissler at six points along Cold Creek. The findings from these samples showed regular bacterial pollution at all points sampled, sufficient to make the stream unfit for drinking without treatment, and to make it unfit for swimming at the next bridge below Wooler, at Orland and opposite the Heissler farm, but not caused by it. Pollution in the Cold Creek opposite the Heissler farm was the most consistently severe, reaching a maximum of 100,000 coliforms per 100 ml. on August 13, 1969. These conditions are not fully representative of conditions over the watershed as a whole, because Cold Creek has a volume of flow much greater than that of any other stream in the Region with the exception of the Trent River and the lower reaches of Percy Creek. The pollution would presumably be greater on smaller streams where cattle take water.

It should be understood that where cattle pollution is concerned the coliform bacteria counts are apt to vary very greatly. At one moment the count may be anything from 10,000 to several million coliforms, and a few minutes later it may have dropped to 0 - 100 coliforms per 100 ml. This does not apply to backwaters of a stream. Samples should therefore always be taken after initial dilution, and even these may vary very greatly.

Fish Kill

A fish kill occurred in July, 1968, on a small tributary of Cold Creek, in Lot 20, Concession III, Murray township. The area affected stretched over a quarter of a mile of stream. More than 100 brook trout were killed along with many other

fish. The suspected cause was a farmer washing a tank used to spray Endrin. This is a powerful poison.

Pollution and Its Effect on Recreation

Outdoor recreation is rapidly becoming one of the preferred forms of leisure time activity and shorelines of lakes, rivers and streams serve as a focal point for many kinds of outdoor recreation. People are drawn to and make use of water for a number of recreation activities such as swimming, wading, fishing, boating, water skiing, viewing, photography and painting.

Different waterbased activities require varying degrees of quality. For primary contact activities such as swimming, wading and water skiing where there is a fairly high probability that a certain amount of water will be ingested, water quality must be quite high. The quality of the water need not be so high for secondary contact activities such as boating and fishing where the likelihood of swallowing water is small. For the third type of activity such as photography, painting and viewing the necessity for quality is reduced even more, provided it is not so bad as to yield obnoxious odours or exhibit obvious effluent content.

The most significant indicator of quality for primary contact activities is the coliform count. The feces of warm-blooded animals are the most important potential sources of water-borne diseases capable of infecting humans.

The other indicators determine the quality for secondary contact activities as well as the non-contact activities.

Many surface water areas of the Lower Trent Region Conservation Authority have standards of quality which fall well below those set as minimum by the Ontario Water Resources Commission.

Swimming, some supervised and some informal, is probably the most prevalent form of summer outdoor recreation along the Trent River. In many locations the quality of the water is less than acceptable (2,400 coliforms per 100 ml.) The firemen of Trenton sponsor and supervise swimming classes, a commendable undertaking in itself, although the classes take place in admittedly polluted water.

In many areas along the beaches of Lake Ontario swimming is virtually impossible due to the masses of algae which, when stranded on shore, often in thick mats, give rise to a highly unpleasant odour.

The quality of boating on the Trent is at times less than desirable owing to the oily scum which occasionally forms on the hulls of pleasure boats and on the bodies of water skiers. Floating rafts of weeds, often found early in the boating season, have forced some of the locks on the canal system to shut down for varying lengths of time.

The decline in quality of fishing mentioned by many people is due to a number of types of pollution.

Floating masses of algae, an indicator of enrichment, makes swimming and boating virtually impossible in certain stretches of the Trent River, such as the branch north of Wilson Island. Aquatic weeds in Rice Lake also spoil the boaters experience and often foul propellers. Weeds, algae and odour also affect the aesthetic qualities of the water, spoiling the view or rendering the experience most unpleasant.

Roadside vegetation on the township line between Percy and Seymour Townships, seen just after unnecessary spraying of the vegetation. Where the vegetation is dead, the area will be of no use to wildlife.

Cattle destroying fish habitat (and probably the quality of the water) of Shelter Valley Creek. Wherever possible the cattle should be watered by farm ponds or by other means.

Thus pollution of various types and degrees can and does affect the outdoor recreational experience in the Lower Trent Region. The Authority should be aware that environments supporting outdoor recreation should be carefully managed as a renewable resource and that along with industry and households, recreation is a primary use of this resource. One of the more important tasks of the Authority is that of working with other agencies, such as the Ontario Water Resources Commission, and using all the means available to it to attain a high quality environment in which water is one of the most important factors.

Section 20

RELATIONSHIP OF WATER AND RELATED LAND RESOURCE PROBLEMS TO THE IMPAIRMENT OF THE ENVIRONMENT.

In addition to the impairment of water, it is necessary to consider the impairment of the environment as a whole as it affects the quality of the basic recreation resource.

Many factors have been recognized, including degradation of the land due to unplanned or poorly planned buildings and building sites (particularly shoreline cottage development), the pollution of water bodies not only by effluent from recreation developments (cottages and boat sewage, oil and gas discharge from outboard motors, and litter from shore picnics), but also from excessive use pressures. This excessive use may lead to the lowering of the quality of a recreational experience through noise and reduced aesthetic appeal as well as hazardous conditions for some activities such as swimming or water skiing.

As a result of increases in demand by our urbanizing population for recreational space, pressures on available resources are rapidly reached the point where the natural ecology of a site, often the very attribute which made it an attractive recreation site, is being destroyed.

Currently we know, but not to what degree, that the urban population of the country possesses a basic physio-psychological need to escape the urban scene periodically, and seek release in an non-urban space, from the real or imagined pressures inherent to city life.

Urban dwellers receive some recreative value from open space experiences directly related to the quality of the landscape.

If it is assumed that the function of planning is to leave open as many future alternatives as possible, then it follows that planning for environmental quality requires:

1. That provision be made for a wide range of outdoor recreation opportunities and related environments;

2. That land should be developed and managed to a degree of intensity suitable to the level of quality required by the purpose for which the area is established;

3. That no parcel of land should be developed or utilized beyond the ability of management required to maintain the quality of the environment, and,

4. That the entire landscape should be viewed as an integral part of the recreative environment.

As mobility increases it becomes more and more essential that the trip element in any leisure time experience be an integral part of the total recreative experience. This coupled with the fact that driving for pleasure is one of the most popular recreative pastimes makes this point even more important.

The environmental control of roadsides is paramount. Such factors as weed killing along rights of way, control of garbage dumps and junkyards visible or noticeable from the road, sign and billboard controls, obstruction of scenery by buildings and maintenance of quality of roadside establishments are significant. The provision of parking areas for landscape viewing, picnicking, and interpretation of the natural and cultural aspects of the landscape is most important in enhancing the landscape and in affording the public a perception and appreciation of an unpolluted environment.

A mainly rural Authority such as the Lower Trent has the opportunity to ensure that development of its resources is controlled in such a way that its environmental attractions are not jeopardized.

To accomplish this, integrated planning with other agencies is required. Thus with careful, integrated, systematic planning a high quality, relatively unimpaired environment may be achieved in which an optimum selection of recreation activities is offered.

It should be noted furthermore that well planned, high quality development (which necessitates careful consideration of local ecological conditions) is more likely to generate long term economic benefits than are poorly conceived and hastily developed facilities, designed to exploit some real or perceived short-run characteristic and social or economic trends. The latter form of opportunism often does irreparable damage to the environment.

terfront lots" for sale on an artificial lagoon development north of Wilson Island. This is an inferior setting cottage development.

This form of environmental degradation can be halted by means of a meaningful education program plus enforcement of Municipal By-Laws.

Section 21
NEEDS AND REMEDIAL MEASURES

1. WATERSHED PROTECTION AND MANAGEMENT

The planning and development of water resources, to meet the many needs of an area, is a complex undertaking. The problem is further compounded by the fact that there is an excess of water in the spring, resulting in flooding and a shortage of water in the summer resulting in drought conditions. The Authority's policy of watershed management should co-ordinate the various interests in the area with the welfare of all the people being the dominant factor determining the best use of the water.

In order to wisely allocate water according to the various user requirements, a knowledge of the resource, both on a quantitative and qualitative basis is required. While analysis based on the watershed characteristics and precipitation data can be made to determine the behaviour of streamflows with respect to time, it is preferable to install streamflow gauges to obtain a continuous record of the flows that actually occurred. Ultimately streamflow gauges should be installed on each of the watersheds. Recommended locations for hydrologic gauges including streamflow, precipitation and snow courses for the immediate future are illustrated on Figure 5-1.

2. FLOOD PREVENTION AND WATER CONSERVATION

Damaging floods that have occurred in the Lower Trent Region have been caused by snowmelt, rain or ice jams or a combination of these factors. As recent as 1968 and 1969, high water levels prevailed in the Trent Canal system in the spring, postponing navigation by pleasure craft until later in the season than usual. A series of storage lakes in the upper Trent area provides capacity to store the spring runoff in the Trent Canal system which is later released for summer operations. As the Trent Canal is operated by the Federal Department of Transport, this report deals only with flooding problems on the smaller streams in the Lower Trent Region.

While these smaller streams are susceptible to spring floods, the threat of summer and fall floods cannot be entirely discounted. Hurricane-generated storms which originate in late summer and fall produce very heavy rains and have a high flood producing potential. Fortunately, no serious damage attributed to this type of flooding has been known in the Lower Trent Region.

Any measure that directly or indirectly reduces damage due to floods may be considered as flood control. There are a number of proven methods of flood control and the methods applicable to the areas investigated will be discussed in this section.

a. *Flood Plain Zoning and Acquisition*

One of the most obvious methods of reducing flood damage is to establish flood zones in which building is restricted or controlled.

Limiting the use of flood plains by zoning requires municipal control of the flood plains. When developing zoning or an acquisition program, there are three important definitions to be considered. The physical interpretations of these definitions are shown on Figure 9-3.

i. Design Floodway - The channel of a river or stream, and those portions of the flood plains and adjoining channels which are required to carry and discharge the flood flow of any river or stream resulting from the occurrence of a specific design storm.

ii. Flood Plain Lands - The area adjoining a river or stream which has been or may be subjected to flooding.

iii. Conservation Lands - In flood plain acquisition programs it is desirable to have a buffer strip between the limits of the design floodway and private lands. Where the valley is well defined, it is preferable to acquire lands to the top of the valley slopes to prevent encroachment and control erosion of the valley slopes.

In the Lower Trent Region, the valleys of the small streams are not well defined. Therefore it is recommended that the minimum acquisition limit beyond the design floodway line be at least 50 feet.

Design floodways have been calculated on the basis of a "Hurricane Hazel" type storm occurring over the particular watershed for Brighton, Colborne, Hastings and Trenton. These areas are illustrated in Figures 21-A1 to A4 respectively.

If the flood plain is occupied by valuable and permanent structures whose removal would be economically impractical then flood control measures must be provided to avoid or reduce damage. These may include one or more of the following types:

b. Channel Improvements

On some streams, deepening, widening or straightening the stream channel may lessen the possibility of flooding. Benefits from this type of remedial measure are confined to the improved section and a short distance upstream. However, it is a feasible method for getting a flow of water past a potentially flood vulnerable site.

Such a site exists in the Village of Frankford. Channel improvements to carry the 1-in-50-year flow on Cold Creek are illustrated on Figure 21-A5. The estimated cost of carrying out this work is $80,000 not including land acquisition.

c. Diversion

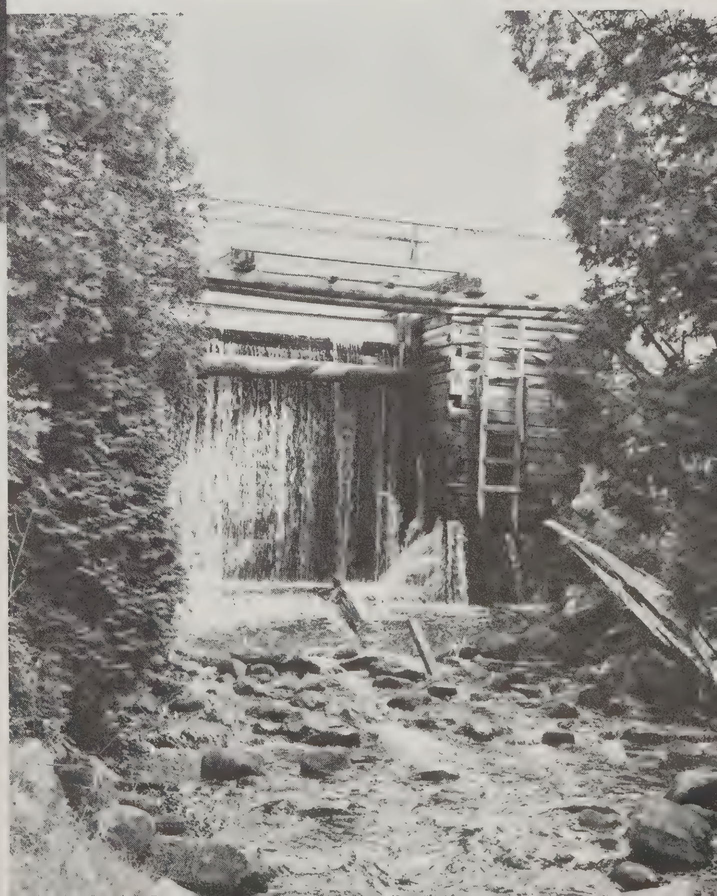
In some cases flood damages can be prevented by diverting the flood channel from their normal channel into an artificial or natural channel that removes them from the area requiring protection. In some cases it may be possible to divert the excess water to another watershed.

d. Diking

Local protection by dikes, forming artificial river banks, is feasible on nearly every stream. With this method, damages are likely to be increased upstream and downstream of the protected area. This type of protection is there-

Recommended location of channel improvements to Cold Creek at Frankford.

Stockdale Dam, a private dam presently used to power a mill, should be included in Authority's flood warning system.



This dam on Salem Creek just above Highway 2 should also be included in flood warning system.

fore usually regarded as an expedient and care must be taken to ensure that conditions above and below the area are not aggravated.

e. Flood Proofing

Flood proofing consists of those adjustments to structures and building contents which are designed to adapted primarily to reduce flood damages. This method is mostly employed by the individual property owners and usually only when there is not sufficient support to proceed with a project to protect the overall area.

f. Reservoirs

Where excess flood waters can be stored in a reservoir, the benefits are more widespread than by any other method of flood control. Reservoirs may vary from small ponds to large structures and may provide any or all of the following benefits:

i. Flood control
ii. Pollution abatement by low flow augmentation
iii. Water supply
iv. Recreation
v. Enhancement of habitat for fish and wildlife.

In order for a reservoir to provide flood control benefits, the reservoir must satisfy two conditions. Firstly, the reservoir must be strategically located so that it controls a significant portion of the runoff from the drainage area above the area requiring flood protection. Secondly, the reservoir must have sufficient storage capacity to significantly reduce the flood peak occurring above the area requiring flood protection.

Two sites were investigated on Cold Creek which complied with these two requirements. The locations of these sites are indicated on Figure 5-1. These reservoirs cannot be justified solely on the basis of flood control benefits and could only be considered possible as purpose reservoirs. The investigations carried out during the survey were of necessity preliminary in nature with no soils investigation being conducted. Therefore, further engineering will be required to determine the feasibility of constructing the dams.

g. Flood Warning System

In addition to the flood control measures previously outlined, the Authority should implement a flood warning system with the private owners of dams in the Lower Trent Region. The purpose of the warning system is to alert the private owners as to impending flood conditions and to co-ordinate the operation of the various dams to minimize flood damages.

Initially it is proposed that this flood warning system include the 12 dams listed in table 21-1. It is noted that, at present, some of these dams are not operable but in some cases the private owners may have plans to operate the dam again. These dams were selected arbitrarily, as satisfying one or both of two conditions: 1) Height of dam about 15 feet or greater and, 2) Reservoir area of ten acres or greater.

h. Ponds

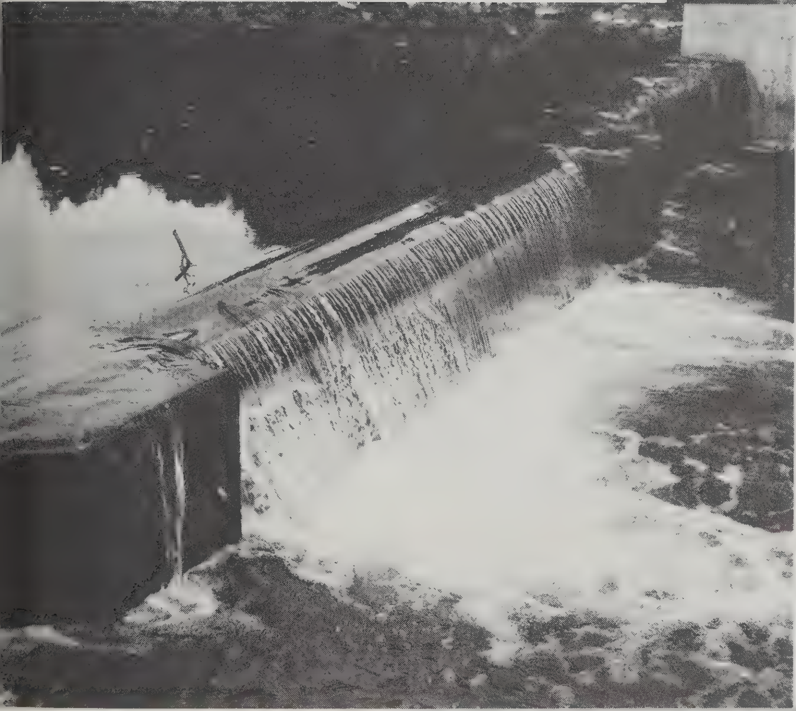
The increased use of water for agricultural and domestic purposes is evident and supplies once satisfactory are now inadequate.

Table 21-1

EXISTING PRIVATE DAMS IN LOWER TRENT REGION WITH HEIGHT OF DAM 15 FEET OR GREATER AND/OR RESERVOIR AREA 10 ACRES OR GREATER

Name of Reservoir or Dam	Location	Stream	Approx. Res. Area (Acres)	Approx. Height of Dam (Feet)
Stapely's Dam	Stirling	Rawdon Ck.	10	13
Norham	Norham	Salt	22	16
Dartford Pond	Dartford	Percy Ck.	43	16
Stockdale Dam	Stockdale	Cold Ck.	25	15
Mutton's Mill	Lot 18, Con. VI Cramahe	Cold Ck.	1	15
Brown's Corners	Lot 32 Con. VI Cramahe	Cold Ck.	8	15
Trenton P. U. C.	Lot 8, Con. I Murray	Mayhew Ck.	12	15
Bowen's Dam	Lot 13, Con. III Percy	Mill Ck.	3	17
Ferguson's Dam	Lot 13, Con. VIII Haldimand	Mill Ck.	20	13
No Name	Lot 4, Con. I Alnwick	Stoney Ck.	16	12
No Name	Lot 21, Con. II Cramahe	Salem Ck.	4	17
No Name	Lot 17, Con. III Haldimand	Shelter Valley Ck.	15	15

Ponds such as this one at Stirling may provide water for fire protection.



Weir on Mill Creek part of intake arrangement for water supply to Warkworth.

ding should not be permitted in
ood plain area. Apple orchards
as along Butler Creek in Brighton
n appropriate use.

ommunity ponds provide emergency water supplies and enhance the appearance of rural communities. One example is the Warkworth ond.

Spray irrigation at Canada Department of Agriculture orchards in Murray Township.

A large bed of Wild Rice on the Trent River below Campbellford. This provides an important source of wildfowl food in early fall.

An attractive beaver pond (and beaver dam in foreground) west of Orland. When the beaver have deserted the area, due to lack of poplar trees, the area will become a "beaver meadow" of no use to wildfowl.

Farm or community ponds provide water supplies for livestock and domestic consumption. Other uses also met by the construction of ponds are fire protection, irrigation and recreation. The aesthetic value of farms and rural communities are also greatly enhanced by the addition of ponds.

During the 1969 survey it was noted that numerous farm ponds dotted the rolling landscape of the Lower Trent Authority. Many of these ponds were simply small holes excavated on the sides of sloping hills, or centred on small streams that traverse the hilly terrain. For the most part they were attempts to collect and store water from heavier runoff periods. Re-charging of these ponds by ground-water sources is not common.

These small excavated ponds while simple to construct often lack suitable stable material to maintain the banks. In many instances the exposed banks are severely damaged by cattle which use the water supply. Eventually the banks become completely broken down, the pond silts in and diminishes in size and function.

This type of farm pond is frequently found adjacent to or dredged within a stream bed. Not only are the banks completely destroyed by the cattle, but the inlets and outlets of these ponds are not properly built. Moreover, if the soil type surrounding the excavated pond is susceptible to erosion, then the life span of the pond is considerably decreased.

In addition to proper pond construction, the location of the farm pond must be given considerable thought. The pond should not be located close to cattle barns or manure storage areas where the water quality in the pond is subjected to undesirable pollutants.

Some typical layouts for various types of ponds are illustrated in the Appendix (Figures 21-A6 and 21-A7). Engineering studies for a community pond at Warkworth were carried out prior to the formation of the Authority and this report provides an example of the required studies for a pond of this size. The Authority should promote the construction of ponds either through direct technical and financial assistance or, where applicable, by advising people of the assistance available from the Ontario Department of Agriculture.

3. MUNICIPAL AND INDUSTRIAL WATER SUPPLY

No problems regarding municipal and industrial supplies were evident during the survey. However, care should be taken that the development of water supplies keeps pace with the continuing economic development of the region.

4. WATER QUALITY CONTROL

The objective of the Conservation Authority should be to see that Rice Lake and the Trent River and its tributaries, along with those streams directly entering Lake Ontario, are cleared of any pollution and that they are then kept clean. An additional objective of the Authority should be to see that the municipal waste treatment plant at Trenton does not pollute the Bay of Quinte.

The following remedial measures are needed for water quality control:

a. It is recommended that the Conservation Authority implement a widespread and continuing program of education of the public concerning the types and effects of pollution. There is an urgent need for education of farmers concerning pollution of watercourses by farm animals, including particularly cattle

and horses, and advising of the possible penalties under the Ontario Water Resources Commission Act.

Farmers should be encouraged to use alternative means of watering their livestock, and if possible, to fence the banks of streams. This would also help to control bank erosion.

b. Until bacterial conditions are improved at Hastings, the Trent River should not be used for swimming at or just below the town, and the river should be posted to this effect.

c. It is recommended that the Authority urge the Ontario Water Resources Commission to enforce stringently the Ontario Water Resources Commission Act against polluters at Campbellford.

d. It is recommended that the Authority urge the Department of Health to post signs at the Campbellford dam, warning of the danger of swimming in the polluted water there.

e. It is recommended that the lagoons at Stirling be adjusted or enlarged so that the effluent is in a satisfactory and reasonably sterile condition.

f. It is recommended that the pollution of the Trent River by large quantities of suds from the Bata Shoe Company be stopped or controlled.

g. At the time of writing this report, the Domtar Company at Trenton was planning to extend the effluent pipe carrying pulp mill wastes into the centre of the Trent River. It is recommended that a new survey be made above, at, and below this new effluent, particularly in time of low flow of the river. The method recommended includes the use of artificial substrates in the manner used by the Ontario Water Resources Commission in 1968. Chemical tests and measures of Biochemical Oxygen Demand should also be made. If the water conditions for aquatic life are at all impaired, more stringent measures should immediately be taken to control the situation.

h. Sprayed material from the Domtar operations dropping into the Trent River and onto people who are on the river should be stopped immediately.

i. It is recommended that the sources of pollution which cause a reduction in the number of taxa (forms of life) on the west side of the Trent River at Trenton be traced and the pollution eliminated.

j. It is recommended that the Authority bring to the attention of the Ontario Water Resources Commission and the Department of Health the pollution of Butler Creek, both above and below Highway 2, and see that this condition is corrected.

k. It is recommended that the Authority, by every possible means, ensure that the waste treatment plant at Trenton is enlarged satisfactorily at the earliest possible date.

l. It is recommended that the condition of Lakeport Creek, both above and below Lakeport, be monitored regularly.

This photograph shows the effects of the effluent from the Bata Shoe Company's operations. The view is upstream and the effluent pipe enters the Trent River at the upstream end of the vast mass of vegetation shown. This tends to overfertilize the river. The photograph is taken from Provincial Highway 33.

Careful disposal of whey in a sandy field, after transport of one mile through a plastic pipe from the Warkworth Cheese Factory. The whey does not reach the woodlands and valley in the background.

m. It is recommended that the source of the extreme pollution of Breakaway Creek be at once determined and the condition corrected.

n. It is recommended that the pollution of Killoran Creek by garbage and other wastes be eliminated.

o. It is recommended that a copy of the Ontario Water Resources Commission Act be sent to the factory with the name Rex Chemicals on it at Brighton and to the factory with the name Saine Chemicals on it at Colborne, and that the methods of disposing of wastes from these factories be examined and the conditions made satisfactory.

p. It is recommended that a circular be prepared and sent to all cheese factories in the Region, (with the exception of the Warkworth Cheese Factory, which has an excellent disposal system), drawing attention to the provisions of the Ontario Water Resources Commission Act concerning pollution of watercourses.

5. IRRIGATION

Fifty-four permits to take water in the Lower Trent region have been issued by the Ontario Water Resources Commission as of June 1969. These permits were mainly confined to Cramahe and Haldimand townships with the main purpose of taking water listed as irrigation. Tobacco farms north of Highway 401 and apple orchards south of Highway 401 usually require irrigating for a continuing successful operation. Sprinkler systems are not used extensively as irrigation is accomplished mainly with water trucks. Sprinkler systems are of course required at the golf courses situated throughout the region.

Extensive surveys regarding the adequacy of the various irrigation systems were not undertaken. However these systems should be watched carefully in the future to ensure that satisfactory water supplies are available for all needs.

6. LAND STABILIZATION AND EROSION CONTROL

The need for land stabilization and erosion control in the Lower Trent Authority is of a type that requires specific definition and location in order to provide for proper conservation planning. Features that influence erosion are the surface slopes and the size, shape and gradient shape of the streams. Soil particle sizes are also important and may be the dominant factor in this area of fine grained soils which are particularly susceptible to erosion by wind and running water. The extensive drumlinization that is present in the north-western areas of the Authority presents potention erosion conditions if the sloping fields fields are cultivated improperly. However, better land use is possible if erosion control is made effective.

The aims of erosion control are to eliminate the problem at its source by promoting techniques that prevent the movement of topsoil.

The Authority could further this objective within the watershed by implementing the following recommendations:

a. Promotion and demonstration of contour tillage planting;

b. Promotion of strip-cropping methods;

c. Promotion of grass-banked terraces across sloping fields, especially in agricultural areas that experience extensive erosional consequences due to intensified row-cropping;

d. Promoting the planting of belts of trees or constructing other barriers for protection against wind erosion, in areas where this is a problem;

e. Encouraging the use of crop residues either on the surface or incorporated in the top-soil;

f. Promoting the minimum of tillage operations consistent with good wood control and seed-bed preparation;

g. Establishing permanent vegetation in waterways in developed agricultural areas through education and an assistance program;

h. Stabilizing gullies with suitable structures;

i. Promoting the fencing of riverbanks where livestock are kept and the creation and use of off-stream water holes such as by-pass or runoff ponds; and

j. Promoting proper logging practices.

7. SEDIMENT CONTROL

There are two different types of treatment available for achieving sediment control: land treatment measures and structural measures.

Land treatment measures have already been discussed under the previous sub-section. The major watershed structural measures commonly used include: 1) reservoirs, 2) stream channel improvements, 3) debris and sedimentation basins and 4) levees, dikes, floodways and floodwater diversions. Of these methods, the debris and sedimentation basin is the only method that is used independently of some aspect of flood control. A debris basin is a reservoir designed specifically to trap sediment and debris. Its capacity is usually equal to the volume of sediment and debris expected to be trapped at the site during the planned useful life of the structure or improvements it is designed to protect. Where periodic clean-out is carried out, the capacity can be reduced accordingly. It is considered that this method could be applied effectively in instances where its relatively high cost is justified.

Existing reservoirs serve as sediment control devices, as sediment is being deposited in the reservoirs. However, the sediment is not being deposited uniformly or in such a way as to permit easy removal. The ability of existing reservoirs to trap sediment is diminishing rapidly. If these reservoirs are to become more effective for sediment control purposes, costly dredging programs will have to be undertaken. Dredging will also provide ancillary benefits such as increased water depth to improve fish propagation. Increased water depth will also decrease weed growth, thus improving the appearance of the reservoir.

A well maintained grass waterway as shown can eliminate soil erosion on sloping fields.

Grass cover on the ski slopes in Haldimand Township could control soil erosion problems.

Direct access to streams by livestock should be restricted; by-pass ponds should be constructed for water supplies.


LOCATION OF GRASS WATERWAYS
POTENTIAL GRASS WATERWAYS
SCALE
MILES
HALDIMAND
CRAMAHE
COLBORNE
Grafton
STIRLING
QUINTE
LAKE ONTARIO

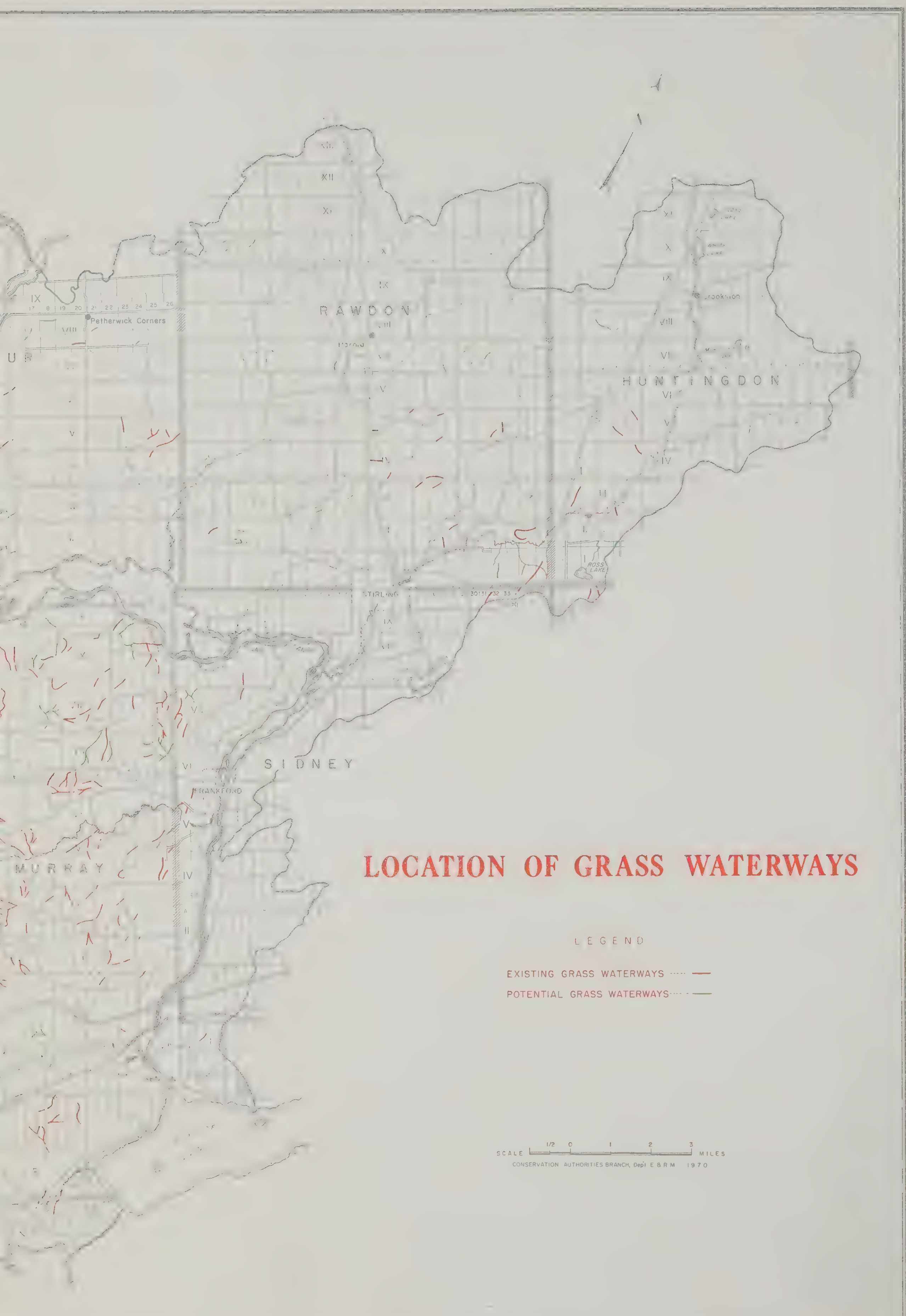

LOCATION OF GRASS WATERWAYS
LEGEND
EXISTING GRASS WATERWAYS
POTENTIAL GRASS WATERWAYS
SCALE 1/2 0 1 2 3 MILES
CONSERVATION AUTHORITIES BRANCH, Dept. E & R M 1970
RAWDON
HUNTINGDON
SIDNEY
MURRAY
Petherwick Corners
STIRLING
FRANKFORD
ROSS LAKE

FIG. 21-1

8. DRAINAGE IMPROVEMENT

There is some interest shown by the farmers to improve soil drainage problems by utilizing tile drainage systems. However, the number of acres actually tiled within the Authority is rather small as there is some hesitancy in implementing sub-surface drainage systems. The reason for limited tile installation could possibly be attributed to the lack of available capital or indecisiveness as to whether a farmer will continue farming his land in the future. The present demand and acquisition of farms by non-farm persons at relatively high prices does influence many farmers on their management decisions. Farm improvements tend to be neglected in a land-speculation atmosphere as presently evident in the Lower Trent Authority.

In promoting tile drainage systems and associated soil erosion control practices on productive agricultural lands, the Authority should provide information for drainage tile systems and tile outletting problems through co-operation with the County agricultural representative.

9. ASSOCIATED LAND MANAGEMENT AND ADJUSTMENTS

a. *Private Land Reforestation*

There are many marginal locations in the Authority, which, by reason of irregular shape, topographic features or limited area, do not lend themselves to a land purchase program for the creation of large-scale, Authority-owned forest areas. Nevertheless, such lands, taken together, can be significant contributors to general landscape conservation programs. In particular, they often represent small, variably sloped fields that should be reforested to curb or prevent erosion, or to contain increases in scrubland acreage. Typically, many of those areas do not conform to local property boundary patterns.

During the survey, studies were used to differentiate the areas that should be planted to trees, from those where pasture improvement is a better mode of soil conservation action to maintain lands exhibiting a favourable capability for agriculture. Many of these appear marginal, due to neglect in recent years. Both types of area have been mapped.

Areas mapped include 1,800 separate areas requiring pasture improvement and 1,100 areas that should be privately reforested. Both requirements are ideally suited to private lands assistance programs of the type generally instituted by Conservation Authorities. Many of the sites chosen for reforestation are associated with existing woodlands. Large areas of this type of conservation problem are typical of townships, where only a small area has been recommended for purchase for Authority forest schemes.

b. *Recommended Authority Forest*

Areas totalling 32,250 acres, recommended for systematic purchase for forest purposes within the Authority, have been selected in such a manner as to generally lend themselves to the principle of property consolidation. In this way the land purchasing approach should provide forest masses that can have a significant effect on resource conservation over a wide area.

It is noticeable that the major concentration of proposed forests are in the townships of Huntingdon and Rawdon, thus suggesting that the north-east corner of the Authority, should be mainly forested including those areas recommended for development as forest and wildlife areas.

A brief description of individual areas follows.

i. Huntingdon Township

This area covers over 9,000 acres between Moira Lake, and the environs of Fuller and Ivanhoe. The approximate eastern half of the area is mainly a natural forest surrounding two forest and wildlife areas which in turn are around Snake Lake, White Lake and Moreland Lake. This major area of existing forest is the principle reason for recommending purchase. The local capability for timber production in reforestation is not high, hence tree planting in existing clear areas is meant mainly to cover and rehabilitate these openings over a period of time.

The portion of this region west of Rawdon Creek, contains a much higher percentage (30 per cent plus) of currently clear farmland, which is mainly used at present as unimproved or roughland pasture. Although these areas present problems of bouldery fields, exposed rock patches and high lime soils, their capability for timber use is greater than the region to the east.

ii. Rawdon Township

Recommendations concerning future forest land purchases in this township cover 8,000 acres, involving basically two acres.

The first, on the township's eastern boundary, ties in closely with the lands recommended for purchase in Huntingdon townships. General characteristics concerning capabilities and the present state of the properties involved are therefore similar. There is a somewhat higher percentage of cleared but rough lands (40 per cent plus), but the same problems of bouldery, high lime soils exist.

The next major block in the township, is located west of Springbrook, along the northern reaches of Squire Creek. One-quarter of this area is open land, which is interspersed with woodlands of varying qualities and densities.

iii. Murray Township

The lands which should be converted entirely to forestry uses in Murray township, are situated in its centre. They exhibit a number of characteristics indicating the local need for reforestation and the creation of forest blocks:

1. Steep slopes and stoney areas,
2. Erosion hazard on sandy soils,
3. Some existing erosion,
4. Natural grasslands being allowed to revert to scrub cover species,
5. Areas of low agricultural capability, and
6. Large areas of natural woodlands.

iv. All other areas selected in Brighton, Percy, Cramahe, Alnwick and Seymour townships, and the south part of Haldimand township, exhibit the same characteristic problems as those found in Murray township.

The major acreages selected in the northern part of Haldimand township, were chosen after first making an assumed practical provision for the expansion of the Durham and Northumberland County Forest block in this region.

If the Authority should decide that it does not wish to operate a forestry program in this particular region, it should promote the incorporation of the Haldimand township areas recommended in this report into the County Forest Program. These areas are west of Burnley and Fenella, as shown on the accompanying map.

A 1,400-acre block of land adjoining the upper reaches of Salt Creek, south of Oak Heights, in both Haldimand and Cramahe townships, has also been recommended for incorporation into an Authority forest scheme. This particular area exhibits one of the more serious sedimentation problems in the Authority. Therefore the improvement of adjacent land uses, the main means of curbing such a problem, is a complex scheme, involving more than forestry practices. It is therefore recommended that this area and its future use as a conservation project, should remain with the Authority rather than in the County Forest system.

c. Contour Ploughing Strip-Cropping and Cover Crops

Field cultivation up and down slopes, barren surface soil left exposed during winter months and the cultivation of row crops on sloping land, all contribute to erosion hazards. Where soils display a high susceptibility to erosion, contour ploughing should be used on suitable slopes.

Contour ploughing is the cultivation of a field at right angles to the natural slope of the land, in order to establish a system of ridges across the slope. These ridges will retard the rate of water runoff from the fields, and in so doing increase the amount of water absorbed by the soil. Furthermore, the rate of soil erosion will be decreased. To increase the effectiveness of the contour ploughing on broad, smooth slopes, strip cropping, which is the alternation of strips of cultivated crops with strips of grassland, is also implemented.

Contour cultivation and strip-cropping not only reduce soil displacement on the slope, but also facilitate working the slopes by reducing the number of turnabouts of the equipment on the slopes. Also power requirements are less than operating machinery up and down the slopes.

Limitations for contouring arise if the slopes are too steep for safe tractor operation or if the terrain is excessively hummocky, as the contouring curves would be excessively sharp. Where small or rectangular fields of transitional cultivation patterns reduce the possibility of implementing contouring, the removal of fences allows for more extensive areas wherein contour ploughing could be utilized.

For situations where the slopes are far too steep for contouring methods, the maintenance of thick forage crop cover is the most appropriate method of

Table 21-2

RECOMMENDED AUTHORITY FOREST AREAS

Township	Total Acreage
Huntingdon	9,850
Rawdon	8,090
Seymour	1,180
Murray	6,990
Percy	1,240
Cramahe	1,950
Haldimand	4,810
Alnwick	1,140
Total	35,250

Loss of productive soils can be curtailed by contour cultivation on sloping fields.

Appropriate erosion control measures on fine textured soils could prevent serious soil losses in the south-central area of the Authority.

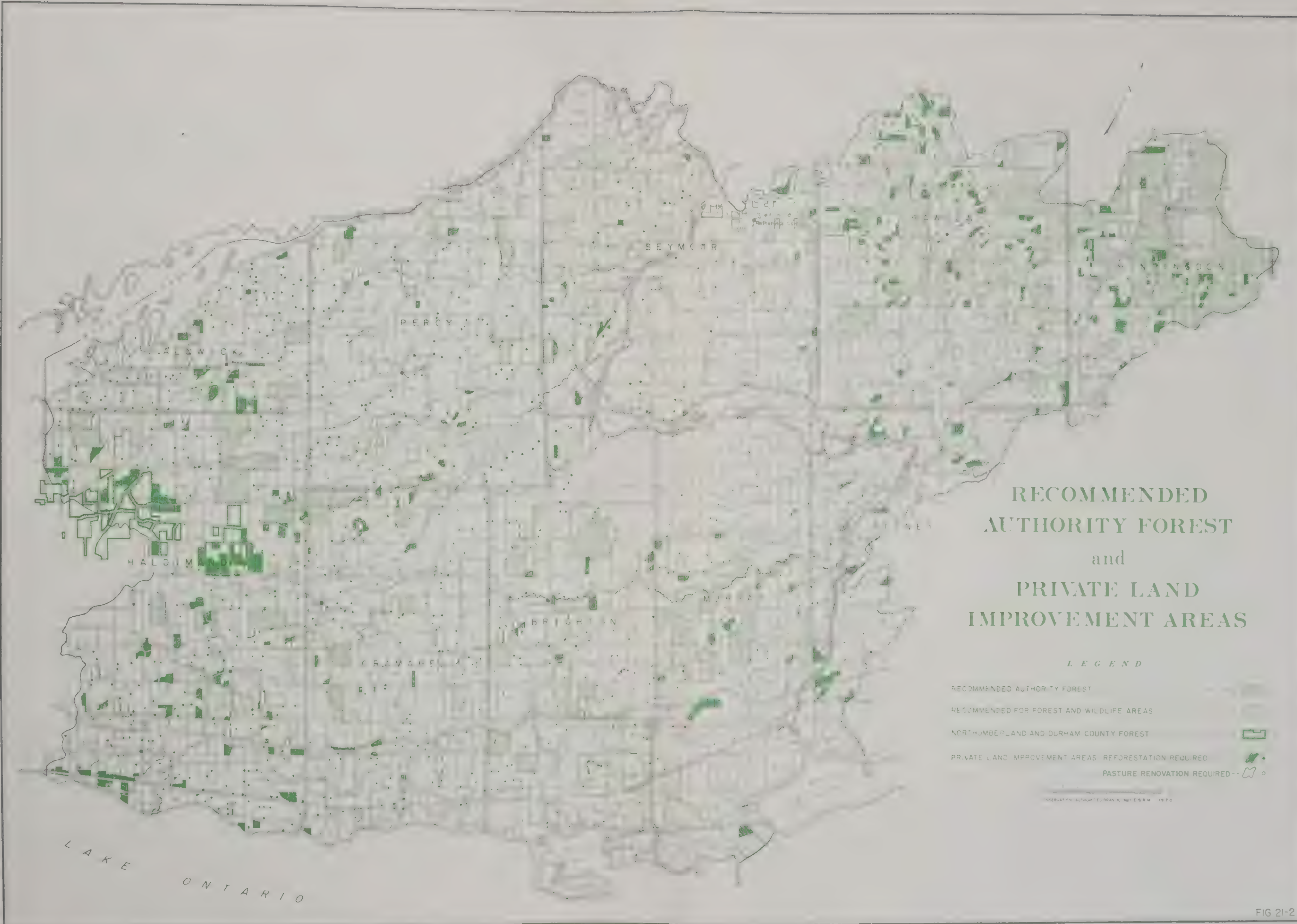
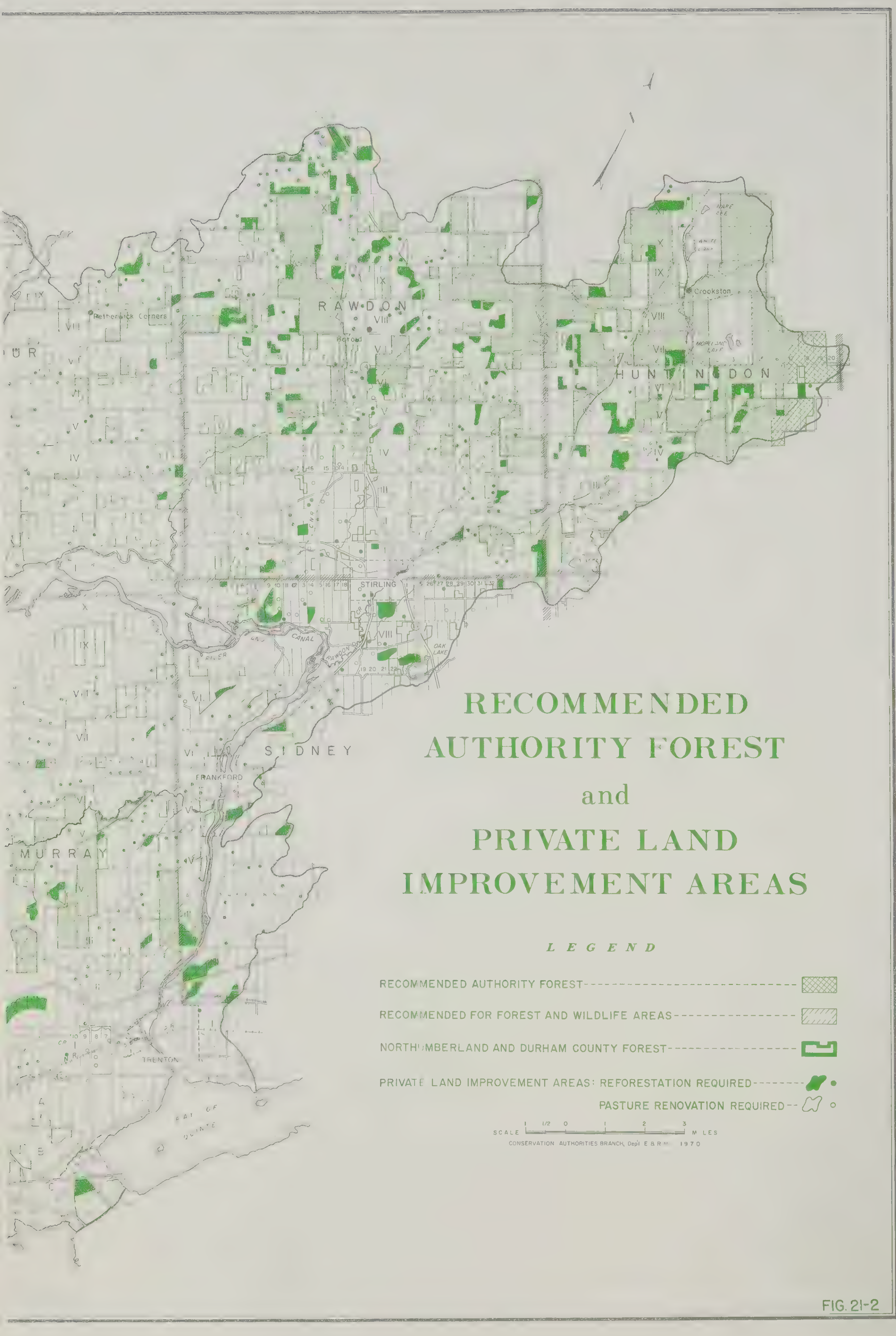

RECOMMENDED AUTHORITY FOREST and PRIVATE LAND IMPROVEMENT AREAS
LEGEND
RECOMMENDED AUTHORITY FOREST
RECOMMENDED FOR FOREST AND WILDLIFE AREAS
NORTHUMBERLAND AND DURHAM COUNTY FOREST
PRIVATE LAND IMPROVEMENT AREAS REFORESTATION REQUIRED
PASTURE RENOVATION REQUIRED
SEYMOUR
PERCY
ALNWICK
HALDIMAND
CRAMAHE
BRIGHTON
LAKE ONTARIO

FIG 21-2



RECOMMENDED AUTHORITY FOREST and PRIVATE LAND IMPROVEMENT AREAS

FIG. 21-2

preventing unnecessary soil erosion. A good plant population on the steep, undulating slopes will prevent the soil from becoming exposed to rainfall and water runoff, if these locations are not overgrazed by livestock.

Another method of field cultivation that is receiving much acceptance today, is grass banked terraces. These terraces are built across steeply sloped fields where contour ploughing would be extremely difficult. Considerably more planning and landscape re-shaping is required to use this type of farming. If the productivity level of the soil is exceptionally high, and if top-soil loss is becoming a serious problem, then terrace farming may be feasible for cash crop type operations.

d. Row Crop Cultivation

In row crop production, the extensive tillage programs often make soil more susceptible to sheet erosion. This is especially evident in corn and tobacco cultivation. Consequently, limited tillage programs have been recommended in recent years by agriculture research authorities.

A limited tillage program essentially consists of a primary fall tillage, without any spring tillage, and a once-over operation with disc harrows and possibly a finishing harrow. Hence the time spent on row cultivation and seed-bed preparation is greatly reduced, and the soil is not overly worked. Prerequisites to implementing limited tillage are:

i. The soil should be well drained;
ii. Fairly stable soil is necessary; and
iii. The soil should possess a high degree of built-in soil fertility.

More recently, no-tillage programs have been introduced for corn production. This method, however, is still in the experimental stages in the Lower Trent Authority.

e. Pasture Renovation

The utilization of Birdsfoot Trefoil for renovating pastures on rough land has displayed very favourable production results per acre. Trefoil does well on deep soils (although it can be grown in locations having only from four to five inches of soil), tends to be drought-resistant, does not cause bloat and has a tendency to persist for years.

In establishing or renovating pastures with trefoil, a three-stage program must be carefully carried out to acquire a successful stand. The first stage consists of removing excess grass sod by heavy grazing followed by grass herbicides. The next step consists of the application of weed herbicides, fertilizer and the broadcasting of trefoil seed. The final stage is proper management of the site during the seeding year with appropriate weed herbicides and fertilizer applications. A well established trefoil stand will dominate in the second and succeeding years.

As there are numerous areas within the Authority, e. g., portions of Rawdon and Percy townships, where roughland pasture could be renovated with Birdsfoot

Trefoil, farm operators in these situations should embark upon a pasture renovation program. Local agricultural representatives will provide detailed information on trefoil renovation when consulted.

Birdsfoot Trefoil has exhibited a potential wildlife value as cover for cottontail rabbits and Hungarian Partridge. Hence, where suitable lands are purchased by the Authority, portions should be selected and laid aside for trefoil establishment, rather than reforestation. Such measures should rehabilitate certain carefully selected marginal lands equally as well as reforestation, and should add to their recreation and hunting qualities.

10. FISH AND WILDLIFE DEVELOPMENTS

It should be recognized at the outset that the following recommendations concerning wildlife must be considered as part of a long term plan. The Authority can, of course, only acquire and improve areas as time and funds permit. Every possible effort should be made, particularly in the case of low dams recommended, to persuade landowners to do these very low cost improvements themselves. The low dams which are particularly recommended are those shown on the accompanying map as Numbers 14 and 15.

Through a public relations program landowners should also be persuaded to set up Wood Duck nesting boxes.

a. Fish

With the exception of streams used for put-and-take fishing (where the fish will be caught before the water warms up) no fish should be planted in the sections of the streams coloured red or green on the map "Biological Conditions of Streams" shown in an earlier section of this report. Most of the blue sections of streams on the map already have brook trout in them. However, if they are streams open to public fishing, they may profitably be restocked at intervals during the summer. The sections coloured in red reached temperatures of 75 degrees F. or higher in the summer of 1969, i.e., they were above the lethal temperature limit for trout. The sections coloured in green are marginal for trout in hot summers.

It is recommended that the Authority encourage farmers and other land owners who own trout streams to open them for public fishing at a fixed daily fee. In addition, it is recommended that the Authority purchase a property in which there is a trout stream and improve the fish habitat with deflectors and other devices, as a demonstration of what can be done, particularly directed towards public and high school children. The area would, of course, be open for public fishing. The stabilization of stream banks will also improve conditions for fish life.

b. Wildlife Areas

A number of areas in the Authority were found suitable for various aspects of a wildlife program including hunting, fishing, wildfowl propagation and nature observation. These are described in some detail in the Appendix but their main features are indicated below. The numbers in the text preceding each area mentioned are the numbers on the accompanying map "Existing and Recommended Areas of Special Interest for Wildlife Management."

1. Moreland Lake Forest and Wildlife Area. This area in Huntingdon township is largely forested. It is excellent deer habitat. The blasting of kettles for wildfowl and the planting of wildlife shrubs will improve the area.

2. White Lake Forest and Wildlife Area. This part of Huntingdon township could be improved for wildfowl and other wildlife species. Snowmobiles should be restricted.

3. Rawdon Township Forest and Wildlife Area. This area provides good conditions for wildfowl, upland game birds and cottontails.

4. Cramahe Hill Forest and Wildlife Area. The area is good for brook trout, ruffed grouse, deer and cottontails. A dam site on the property should not be developed without study of its effect on stream conditions for brook trout.

5. Orland Forest and Wildlife Area. This area in Brighton township could be made for waterfowl.

6. Seymour Township Pothole and Marsh Area. This area is excellent for wildfowl. It may need a more permanent dam.

7. Murray Canal Wildlife Area. The section south of the canal is leased to hunters. The part north of the canal is excellent for wildfowl and should be publicly acquired.

8. Trent River Wildlife Refuge. The area at the mouth of Squire Creek would make a good refuge to propagate and harbour wildfowl and thereby extend hunting in neighbouring areas.

9. Brown Corners Refuge. This small pond would make an excellent refuge.

10. Percy Township Kettle Area. The potholes could be improved by blasting.

11. Dartford Pond Wildlife and Recreation Area. This was potential for a public fishing area. Pollution of the pond should be cleared up.

12. Codrington Public Hunting and Fishing Area. This area north-west of Codrington contains mixed woodland and scrubland with scattered poor pasture and a trout stream.

13. Stevenson Lake Wildlife and Recreation Area. The whole area appears very attractive to wildlife with excellent grouse and rabbit cover.

14. Lamey Lake. The acquisition of the marsh and construction of a control weir would improve the area for wildfowl.

15. Killoran Lake. Replacement of the beaver dam by a rock dam and blasting holes in the cattails would produce an excellent wildfowl area.

16. Marsh in Cramahe Township. The vegetation is good for wildfowl and there is a possible damsite here.

17. Pond North-west of Colborne. This area is suitable for a public hunting area providing habitat for wildfowl, ruffed grouse, pheasants and rabbits. Some pollution control is needed.

18. Burnley Marsh. A dam would be needed to hold water in the marsh which now goes dry.

19. Marsh East of Biddy Lake. To make this marsh more attractive to wildfowl, additional food plants should be planted and potholes blasted.

20. Petherwick Marsh. This area could be improved by a low dam and introduction of additional food plants.

21. Marsh in Concession IX of Rawdon township. To keep the marsh permanent, a low dam is required. Introduction of food plants and blasting of potholes are recommended.

22. Breakaway Creek Area. This is suitable for acquisition or addition to the Brighton Public Hunting Area.

23 and 24. Depth Contour Maps. Maps of Biddy Lake and Oak Lake are included in the Appendix. Both lakes warrant further examination to determine if they are suitable for fish stocking.

c. Murray Marsh Wildlife and Recreation Area

This large area is being gradually acquired for wildlife, upland game hunting, fur trapping, a wildfowl refuge and development of recreation facilities. The Authority should co-operate by notifying the Department of Lands and Forests of any lands that may come up for sale in this area.

d. Spraying of Roadside with 2-4-d

It is recommended that the Authority urge that the spraying of vegetation along roadsides in Percy township be confined to those areas where drainage is affected. Most of the roadsides in Percy township are sprayed without regard to the drainage pattern. This greatly affects the wildlife cover and food plants, besides wasting the taxpayers' money.

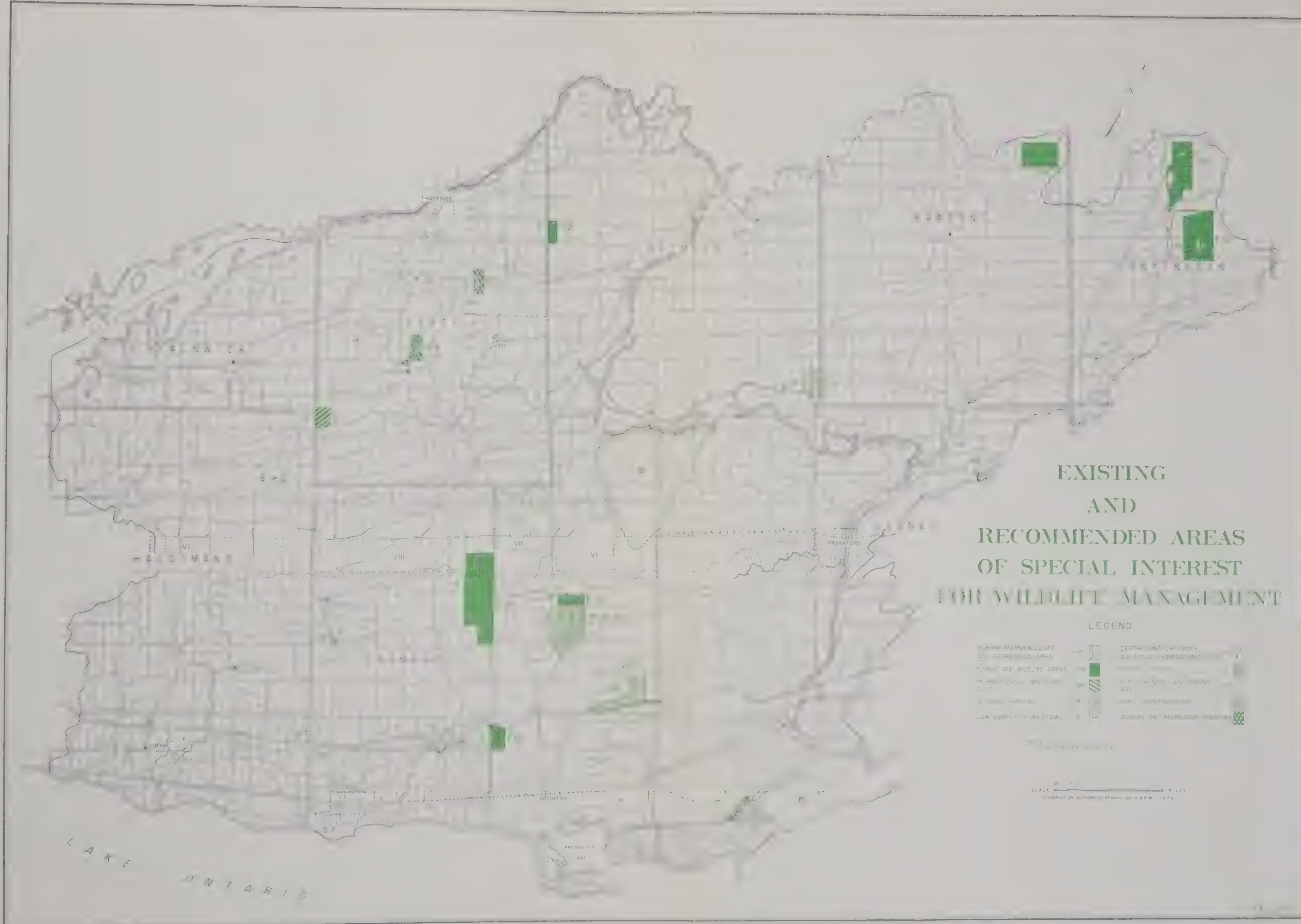
The Authority should pursue the same policy in all of the townships in the Region, and should publicize the unnecessary and wasteful spraying of roadsides unless the vegetation actually impedes drainage or visibility.

e. Wood Duck Nesting Boxes

Extensive tests in many states in the United States have shown that where nesting trees with adequate holes in them are not available, the populations of Wood Ducks can be greatly increased by the placing of artificial Wood Duck nesting boxes in suitable areas, either in water or in marshes close to water. A suggested design of a simple raccoon-proof Wood Duck nesting box is therefore shown in the Appendix. It is recommended that the Authority build a small number

First class fish cover in a trout stream. This is a part of Cold Creek west or Orland, in the proposed Cramahe Hill Forest and Wildlife Area.

Good wildfowl cover in a pond backed up by a beaver dam. This could be cheaply made into a permanent pond. It lies in Lot I Concession III of Cramahe Township, half a mile north of Highway 401.


EXISTING
AND
RECOMMENDED AREAS
OF SPECIAL INTEREST
FOR WILDLIFE MANAGEMENT
LEGEND
FOREST AND WILDLIFE AREAS
CONSERVATION AUTHORITIES BRANCH
HASTINGS
FRANKFORD
BRIGHTON
LAKE ONTARIO

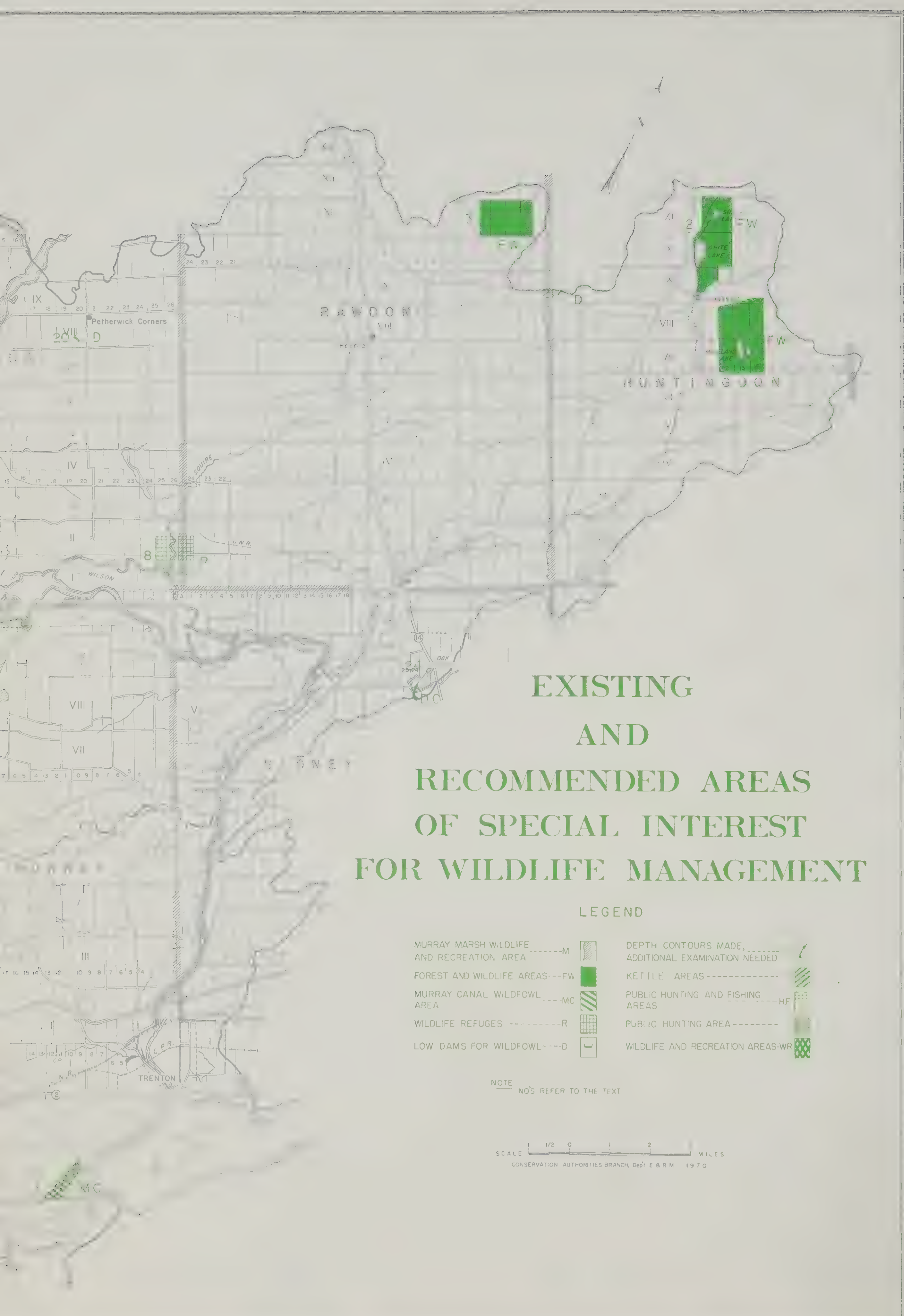

EXISTING
AND
RECOMMENDED AREAS
OF SPECIAL INTEREST
FOR WILDLIFE MANAGEMENT
LEGEND
MURRAY MARSH WILDLIFE AND RECREATION AREA - - - - - - M
FOREST AND WILDLIFE AREAS - - - FW
MURRAY CANAL WILDFOWL AREA - - - MC
WILDLIFE REFUGES - - - - - - - - - R
LOW DAMS FOR WILDFOWL - - - D
DEPTH CONTOURS MADE, ADDITIONAL EXAMINATION NEEDED
KETTLE AREAS
PUBLIC HUNTING AND FISHING AREAS - - - - HF
PUBLIC HUNTING AREA
WILDLIFE AND RECREATION AREAS-WR
NOTE
NO'S REFER TO THE TEXT
SCALE 1/2 0 1 2 MILES
CONSERVATION AUTHORITIES BRANCH, Dept. E & R M 1970
RAWDON
HUNTINGDON
SIDNEY
MURRAY
Petherwick Corners
TRENTON
WHITE LAKE
C.P.R.
WILSON
SQUIRE
FW
D
MC

FIG. 21-3

of these boxes, and place them in appropriate places, particularly where there is a supply of Lemna (Duckweed) available. Lemna can, if necessary, be introduced and will rapidly spread over any fertile water surface. This, with the invertebrates which are attracted to it, provides excellent food for young Wood Ducks.

If the boxes set out first are used successfully, a large number of additional boxes can be cheaply made and erected.

f. Natural History Observation

Since Presqu'ile Provincial Park is ideal for natural history observation, and the Murray Marsh Wildlife and Recreation area proposed by the Department of Lands and Forests (and lying in the centre of the Region) will be almost equally attractive to naturalists, no special areas are recommended for the attention of naturalists except the Forest and Wildlife Areas which are recommended in this report.

11. Recreational Development

In the realm of outdoor recreation, where demands are growing at a rate exceeding the supply of suitable facilities available, the requirement for planning focused on both the current and long-range needs must be emphasized.

Due to the decrease in the amount of land available caused by the escalation of land values, the development of private facilities such as homes and cottages, as well as the increasing public search for leisure time activities, it is unlikely that the Authority will ever have excessive amounts of land for recreation development. In addition to outright purchase of land the Authority should investigate such alternatives as (1) limited control through the use of easements for various types of trails and buffer zones around conservation areas or along scenic routes; (2) open space zoning in conjunction with agricultural and residential development zoning; (3) cluster zoning for cottage development; (4) obtaining commitments of sale from owners to be exercised at such times as the land is disposed of; (5) lease back arrangements with former owners; and (6) solicitation of gifts of land making use of the "Foundation" principle.

Development of recreation areas should be carried out only after careful planning, using the skills of qualified consultants such as landscape and building architects. Unplanned development can often lead to over-use or misuse and non-renewable resources such as swimming beaches, scenic lookouts and rare biotic communities cannot be regenerated nor relocated if they deteriorate through abuse. At no time should long-range goals be sacrificed for short-term expediencey.

Owing to the number of agencies in the Authority involved in recreation planning and development, care must be taken to ensure that planning and development by these agencies and the Authority does not conflict, nor unnecessarily duplicate one another, but instead, be complementary. Those agencies providing recreational facilities should be encouraged to consult the Authority regarding present and future plans. Liaison should be established with such agencies as the Department of Lands and Forests, the Lake Ontario Regional Development Council, the Department of Highways, the Department of Transport and with neighbouring Authorities in order to achieve regionally co-ordinated planning.

As an aid to planning, a classification of recreation land should be established. The classification outlined in the Appendix can be used as a guide.

Because the Authority represents all municipalities within its boundaries, it is in an ideal position with regard to the broad problem of environmental conservation. The Authority can assist in the co-ordinating and planning of local by-laws to control dumping, various types of pollution, building codes and undesirable land use and zoning. The tasks of the Authority should include the promotion of an awareness of the need for protecting or re-establishing the natural beauty in the landscape.

In the southern portions of the Authority off Highway 401, a large amount of land, ideally suited for extensive outdoor recreation uses such as hiking and cross-country skiing, has been posted and is lost to public use. There is an opportunity here for the Authority to attempt to improve hunter-landowner relations through actively supporting various hunter safety programs, such as those sponsored by the Department of Lands and Forests and some game and fish clubs. A similar advertising campaign might be useful to persuade the landowner to open his land for other recreational uses such as hiking.

Privately owned recreational facilities are important in developing a varied and attractive recreational landscape. However, many operators are not familiar with the technique of establishing, operating, and maintaining a high quality facility. The Lower Trent Authority could fulfil a useful role in providing study sessions and workshops in co-operation with agencies such as the Lake Ontario Regional Development Council and the Department of Tourism and Information for private recreational facility operators.

From a recreational standpoint, the single greatest asset of the Lower Trent Conservation Authority is its beautiful scenery. Although the most popular form of outdoor recreation is driving for pleasure, the Authority is lacking in any formal scenic drives. Scenic lookouts, picnic areas and small campsites should be developed along the scenic drive routes. In addition, interpretative facilities should be installed to explain the geologic and glacial formations such as drumlins, eskers, various types of moraines, the history of the Great Lakes, the bedrock geology and the geological history of the area.

Opportunity also exists for the development of cross-country trails for hiking, skiing, horseback riding and snowmobiling.

There is a definite need for water access points along the Trent Canal and Lake Ontario. The Authority should consider acquiring small parcels of land along these water bodies and installing boat launch and picnic facilities as well as some "boat-in" campgrounds. The Authority should realize, however, that these smaller areas involve maintenance costs which it is not feasible to recover through user fees.

By providing recreation space of a high quality, conservation areas contribute to the needs of the human resource and the natural ecosystem. They can be a source of knowledge so that individuals can take a stand on resource management questions, provided that every exposure in a conservation area is a meaningful educational experience.

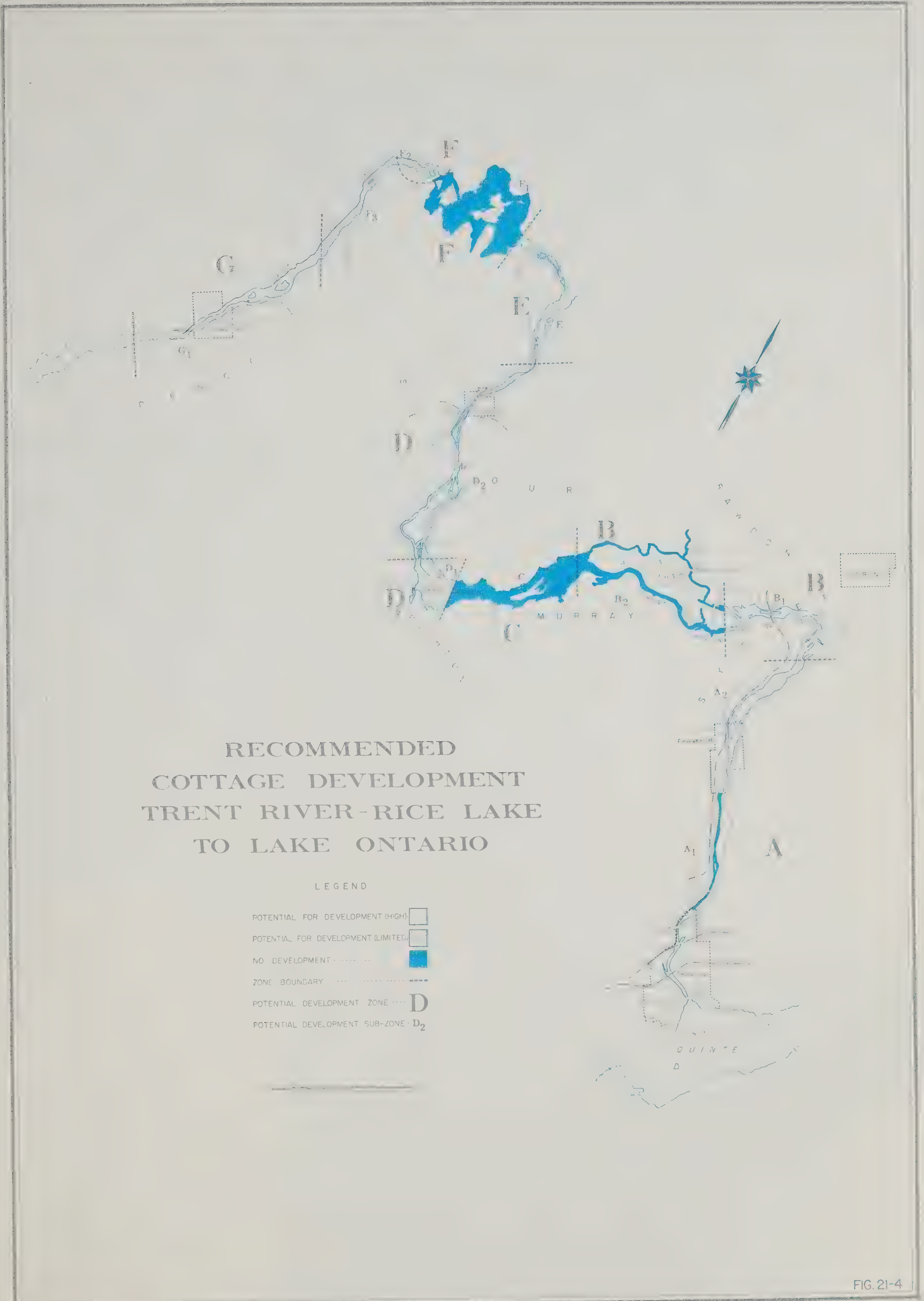

RECOMMENDED
COTTAGE DEVELOPMENT
TRENT RIVER-RICE LAKE
TO LAKE ONTARIO
LEGEND
POTENTIAL FOR DEVELOPMENT (HIGH)
POTENTIAL FOR DEVELOPMENT (LIMITED)
NO DEVELOPMENT
ZONE BOUNDARY
POTENTIAL DEVELOPMENT ZONE D
POTENTIAL DEVELOPMENT SUB-ZONE D2
A
A1
A2
B
B1
B2
C
D
D2
E
F
G
G1
MURRAY
QUINTE

FIG. 21-4

Many thousands of years of geologic history have been exposed in this gravel pit. An interpretation of the layers of sand, silt and gravel would be valuable for outdoor education.

With very little effort this site beside Shelter Valley Creek could be developed as a picnic area.

Portion of a recreation site proposed on Shelter Valley Creek suitable for picnicking.

Opportunities catering to all tastes should be provided. Bathing beaches, campgrounds, and picnic areas are always popular but at the same time there are some individuals who are not attracted to this type of experience. They may prefer instead, more extensive, solitary pursuits such as hiking, cross-country skiing, horseback riding or merely contemplation. While catering to this latter group is difficult to justify in economic terms, it should be one of the goals of conservation to meet the desires of these individuals in the context of broader social benefits.

The Lower Trent Region Conservation Authority has a number of potential sites and areas which could be developed in accordance with the above concepts.

The following sites have been identified as suitable for recreational development of the type indicated. Ownership has not been investigated and these areas are not necessarily available to the Authority. The only private uses in conservation areas should be concessions for specific services for public consumption, and these should be located in service zones within the areas. Private leases for cottage development are not recommended.

The following resumé is divided into two major categories: potential conservation areas, and proposed scenic drives and cross-country trails. The "Class" noted for some of the areas is the "use zone" category as described in some detail in the Appendix.

a. Proposed Conservation Areas

Site 1) White Island

A portion of this island, situated on Rice Lake, can be utilized as a Class III recreation area providing facilities for boaters on the Trent Canal System. A boat-in campground and picnic facility should be developed here.

Site 2) Viewpoint

This site provides a panoramic view of Rice Lake, islands on the lake, and the surrounding rolling countryside. Although somewhat removed from areas of heavy vehicular traffic this area has been included in one of the scenic drive routes described later, and would provide an excellent Class III site for picnicking and viewing.

Site 3) Winter Sports

The Lower Trent Region Conservation Authority has a number of locations suitable for establishment of ski and toboggan facilities. Although the amount of snow accumulation found at this point was not ascertained during the survey, this area with its north facing slope is one of the better sites for these activities. Its proximity to Highway 45 also favours this area for development as a Class II year-round use area, providing areas for family skiing, tobogganning, and camping and picnicking.

Site 4) Dartford Pond

This small area to the west of Dartford Pond would join the larger area proposed as a Forestry and Wildlife area to the north. It can be developed as a Class II site offering picnicking facilities as well as a small dock for boats. The pond can be used for fishing.

Site 5) Viewpoint and Picnic Area

This area located on the side of the hill, overlooks the Trent River and affords a pleasing view of the village of Hastings. A small picnic area and viewpoint can be established here providing a rest stop on the scenic drive described later.

Site 6) Cedar Island

A small boat-in campsite and picnic area developed here would provide a much needed facility to boaters on this stretch of the Trent Canal.

Site 7) Boat Access

This small site is located at the end of a closed road allowance that runs down to the water and an inexpensive boat launch facility as well as a few picnic tables could be located here. There is ample room for parking approximately ten cars with trailers.

Site 8) Viewpoint

This area is located atop a large drumlin on what has been called "Drumlin Drive." From this area a 360-degree view of the surrounding pastoral landscape can be had. The Trent River can be seen to the south and to the west. A large stand of white pine makes this a pleasing site for picnicking or viewing.

Site 9) Sugar Shack

This building, where maple sap is "boiled down" to maple syrup and sugar could be the scene of popular spring-time recreation and educational activities.

Site 10) Harold Recreation Area

A Class II area could be developed here providing facilities for camping and picnicking. Extensive use could be made of the area for hiking and horseback riding, as well as cross-country skiing.

Site 11) Rawdon Range

This large Class I area abuts the wildlife area recommended elsewhere in this report. This area should be kept as a natural area containing natural streams, wilderness areas and should receive minimal development. The area would be ideal for extensive outdoor activity such as hiking, horseback riding and snowmobiling.

Site 12) Pancake Hill

This is a large gravel pit which appears to be no longer worked, covering approximately 50 acres. Excellent views may be attained from this area. Limited camping facilities could also be established.

Site 13) Picnic Area and Viewpoint

A picnic area should be established on this site overlooking Rawdon Creek, and the village of Stirling.

Site 14) The Glen Miller Rock

This glacial erratic, sometimes called the Bleasdell Boulder is an unique feature of the watershed, and must be preserved. The Authority should acquire the area surrounding the rock as a Class I natural feature, and the boulder and the surrounding area preserved from development. A fairly large tract of land should be acquired and little development if any occur here. The Authority could negotiate the preservation of the erratic with the Department of Highways or the Nature Reserves Advisory Committee through the Parks Branch of the Department of Lands and Forests.

Site 15) Murray Canal Campsite

This area located on the south side of the Murray Canal just west of Highway 33 was for sale during the summer of 1969. Camping and picnic facilities could be established here to form an excellent Class II site catering to boaters as well as land based recreationists.

Site 16) The Breakaway

This small area on a proposed scenic route is adjacent to a larger area proposed elsewhere in this report. This particular site contains some interesting land forms. The area is known as the Breakaway in that it was formerly a large lake which broke through a dam approximately 100 years ago and drained away towards Highway 30. This is an ideal site for geomorphological interpretation. It contains an old lake bed, the breakaway gap itself, two classic kettles and a well defined esker which could be shown on a plaque and interpreted. The area would also be suitable for limited camping and picnicking.

Site 17) Norham Pond

A small Class III site can be developed here incorporating the old sawmill building, and the area surrounding it. Campsite and picnic facilities could be established here. A dock for small boats could be provided for fishing.

Site 18) Skiing and Viewing

This pleasing site could be developed as a viewpoint and picnic area looking out over Salt Creek and the surrounding landscape. Depending on the amount of continuous snow cover, limited family skiing and sledding could be participated in here during the winter months.

Site 19) Lake Ontario Beach

This large Class II area is as yet undeveloped. A large portion of the area is a fine beach, suitable for much of the summer season for swimming. The beach runs from the road to the water, and is wide enough to provide parking facilities. The eastern portion of the area could be developed for camping and picnicking.

Site 20) Shelter Valley

This area should be purchased as soon as possible, as should the other areas recommended along the Shelter Valley Creek. The land will be expensive to acquire but acquisition by the Authority should take place, thus preserving portions of this, the most scenic area of the watershed from an exclusive, urban type development.

This site stretching from south of Highway 2 to Highway 401 is very scenic and that portion south of Highway 401 should be left as a natural area. The portion of the site south of Highway 2 can be developed for camping as well as day use. This area could also serve as the starting point for three hiking trails and a scenic drive route recommended later.

Site 21) Shelter Valley

This is an established commercial camping area, the acquisition of which should be investigated by the Authority. This revenue producing Class III area could be developed as a beautiful recreation-conservation area by the Authority. Some minimal improvements are required, but these could be done at little additional cost.

Site 22) Shelter Valley

The third area on Shelter Valley Creek recommended for acquisition is located approximately one mile west of Vernonville. Limited picnic facilities could be established here to cater to hikers and drivers of the scenic route through the valley. Other than this, the area should be left as natural as possible.

b. Hiking Trails, Scenic Drives and Boating

i. Hiking Trails

To cater to this popular, rapidly growing form of recreation, work should be instituted immediately to plotting and laying out hiking trails as well as formulating guide books to these trails.

Trail I - starts at Site 20 recommended above, and winds its way northward along the Shelter Valley over morainic deposits and pastoral landscape, connecting eventually with an established trail in the Northumberland County Forest.

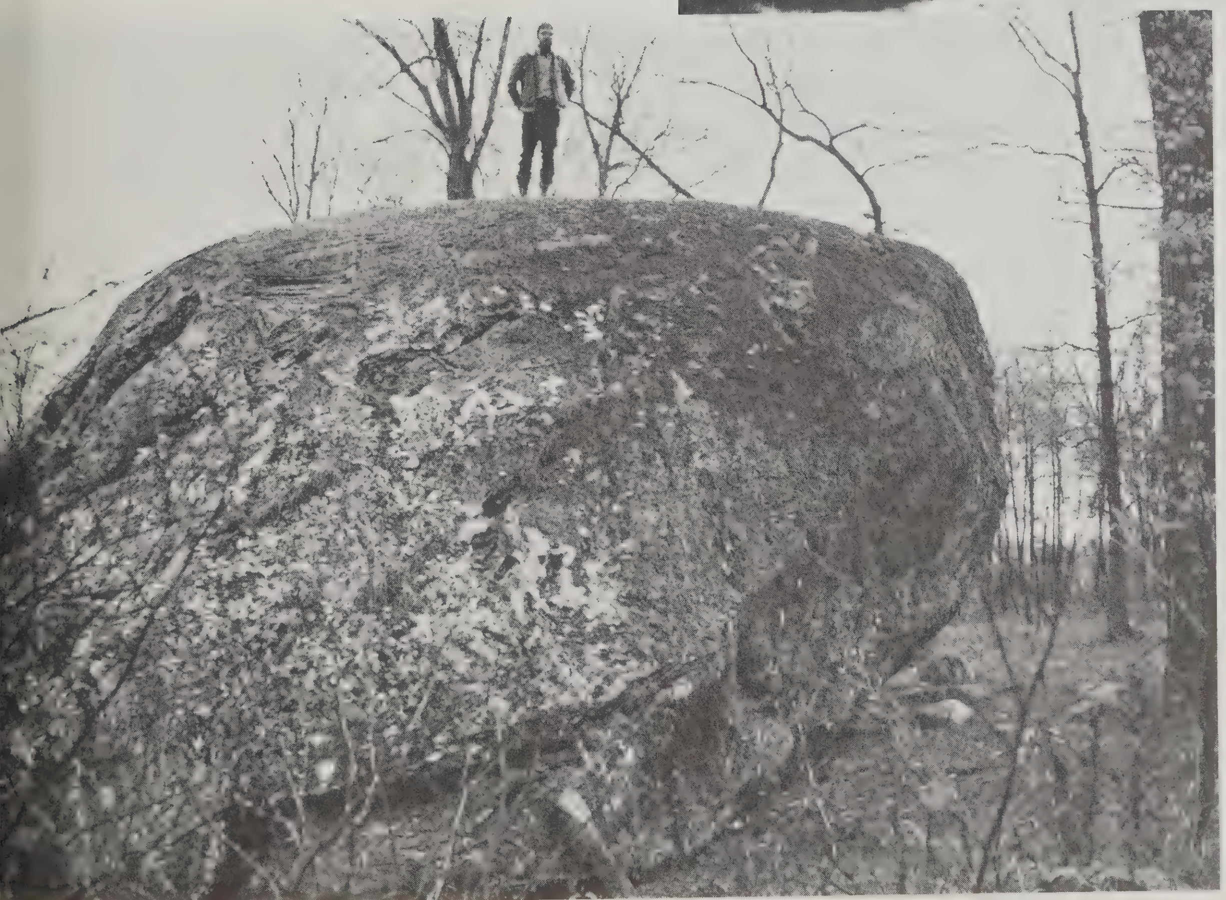
Trail II - originating at Site 20 this trail proceeds east then north over a glaciated landscape, drumlins, lacustrine deposits and stranded sand beaches, as well as through woodlots and swamps. The trail would also connect with established trails in the Northumberland County Forest. Eventually a hiking trail could be established connecting the County Forest with the Ganaraska Trail.

Trail III - follows the abandoned railway right-of-way along the length of Authority south of Highway 2. Magnificent views of Lake Ontario can be obtained along this route. It would tie in with the trail proposed for the Prince Edward Region Conservation Authority.

Trail IV - is a short loop trail through the "Murray Hills" offering varied terrain and magnificent scenery.

Trail V - is the longest hiking trail recommended to the Authority. It would originate at Site 25 on the Murray Canal and terminate in the large White Lake - Moreland Lake Forestry and Wildlife Area recommended elsewhere in this report. The trail crosses the Murray Hills, follows a scenic stretch of the Trent River shoreline, traverses high hills offering views of the surrounding landscape, utilizes unopened road allowances, and in general will offer a challenge to the experienced hiker as well as providing suitable stretches for the novice.

A doorway to new experiences. A portion of the hiking trail proposed in the Murray Hills.



The Bleasdell Boulder. This glacial erratic, reputed to be the largest in Southern Ontario, is a geologic phenomenon deserving protection.

ii. Scenic Drives

The routes shown were selected to cover as diverse a terrain as possible and a variety of points of interest along their lengths, such as topography and scenery. It is felt that the routes selected will provide a number of visual and educational experiences for the driver and his passengers. Nearly all types of roadways are covered except multi-laned Highway 401. The routes vary in length but all can be covered in a day or less and are designated by the numbered intersection shown on the map.

Route 1-2-1: this route covers the north-eastern sector of the Authority. It traverses the flat limestone plain as well as the primitive White Lake-Moreland Lake Area. Proposed recreation sites 9, 10, 11 and 12 are located along the route as are a number of scenic viewpoints.

Route 2-3-4-5-15-6-7-8-9-10-1: this is an extensive route covering much of the central portion of the watershed. The stretch from 2-3 has been named "Drumlin Drive", in that the road passes over and around a number of these glacially produced landforms. Side trips to Ferris Provincial Park, a number of the lock stations on the Trent Canal, and the Murray Marsh may be made. This route passes a number of proposed conservation-recreation areas. Loop 8-9 has magnificent views of Percy Reach and the Murray Hills along its lengths.

Route 10-7-6-13-12-11: this follows Cold Creek for some distance and traverses a very scenic area. A side trip can be made to the Smithfield Experimental Station operated by the Department of Agriculture. Other interesting features on this route are the Murray Canal and the Trent River.

Route 7-11: this bisects the foregoing circle, taking the driver across the scenic Murray Hills.

Route 12-13-14: this passes through the village of Smithfield with views of the surrounding area. A side trip may be made to Presqui'île Provincial Park.

Route 4-26-23-24-25-3: this crosses the rolling uplands of the Authority and past the Dartford Pond. A number of kettle lakes such as Stevenson Lake and Lamey Lake may be viewed from this route. A side trip to the Village of Trent River is possible. This drive also parallels the scenic Trent River.

Route 4-26-23-19-16-27-5: this is probably the most interesting and most scenic route of all. This route is approximately 90 miles long and the best part of a day should be devoted to the drive. The loops through Shelter Valley are especially pretty. The Northumberland County Forest offers walking trails and scenic viewpoints. In addition, a side trip may be taken to visit the Department of Lands and Forests Fish Hatchery and Bird Rearing Station at Codrington, Loop 20-21-22 may be included to give views of Rice Lake and the islands.

Route 16-18-19-20-Hwy. 45-Hwy. 2: this short circle is very scenic and again passes along the length of Shelter Valley.

It will be noted that nearly all of the scenic drives pass proposed conservation areas. The Authority should prepare a small distinctive scenic route

directional sign and should also prepare a guidebook and/or map showing the routes and features of interest along them. It should be printed in quantity for wide distribution.

iii. Boating

The major recreational feature in the Lower Trent Region Conservation Authority is, of course, the Trent Canal. This scenic waterway, which wends its way through the Authority from the town of Trenton on Lake Ontario to Rice Lake, and on to Georgian Bay, attracted approximately 18,000 boaters in 1969. Many of these boaters passed through the Canal in the area bounded by the Authority.

It is in the stretch from Trenton to Rice Lake that boaters, entering the Canal at Trenton with the intention of navigating the total length of the Canal, gain their first impressions of the Canal, its features, operation facilities and recreation opportunities. Much local use is made of the Canal by cottagers and local residents for water based activities as well.

As well as power boats the Trent River and Canal is a fine base for canoeing. Cold Creek and Rawdon Creek offer limited suitable areas for canoeing, especially in the spring. At other times streamflow in these Creeks is insufficient to cater to this activity to any great extent.

The Authority can play an important role in helping to improve the boaters' experience by co-operating with the Federal Department of Northern Affairs in supplying facilities such as boat-in campsites, picnic areas along the Canal and boat launching facilities.

A more detailed description of the Trent Canal and a proposal for its development is found elsewhere in this report.

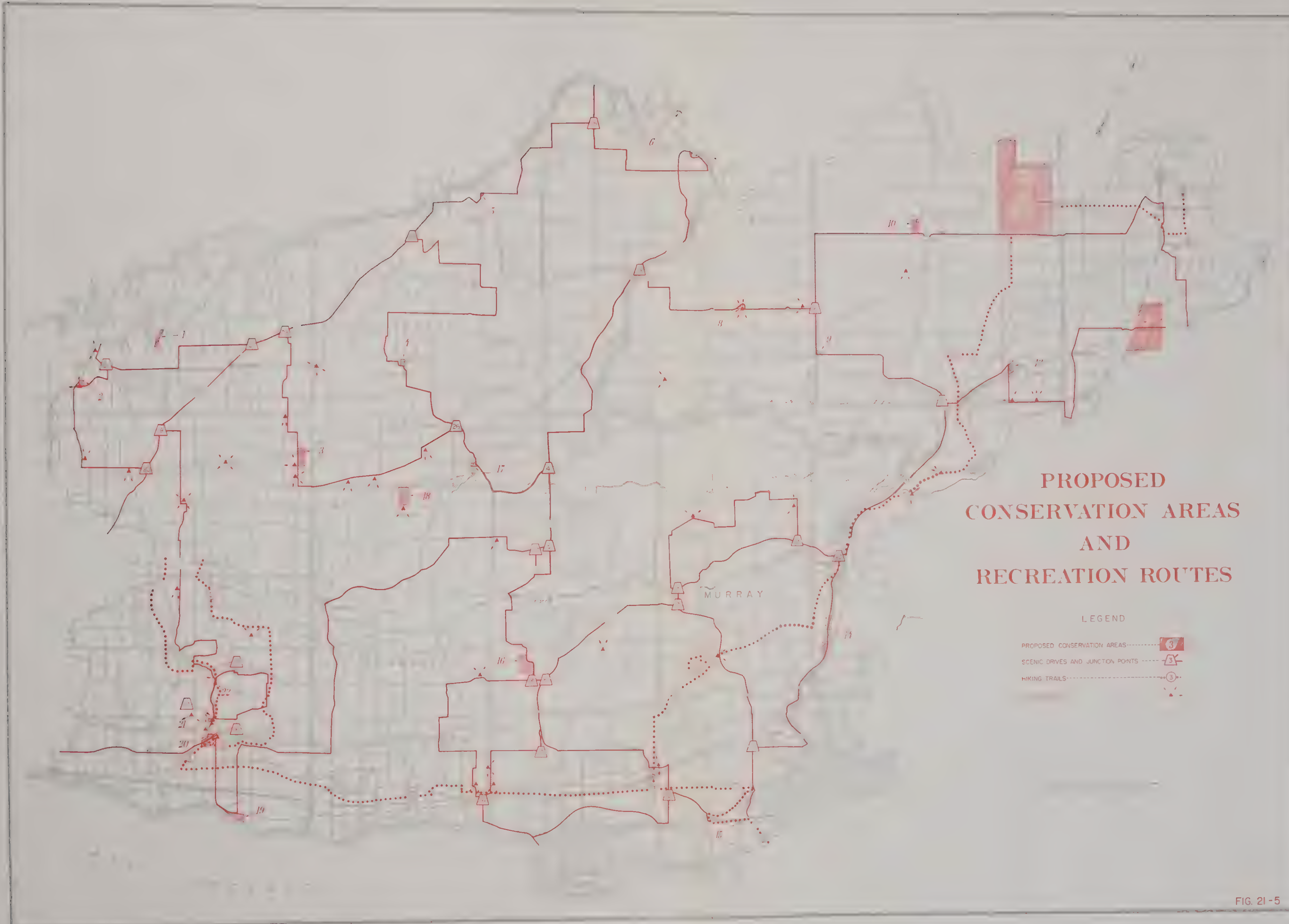

PROPOSED
CONSERVATION AREAS
AND
RECREATION ROUTES
LEGEND
PROPOSED CONSERVATION AREAS
SCENIC DRIVES AND JUNCTION POINTS
HIKING TRAILS
MURRAY

FIG. 21-5

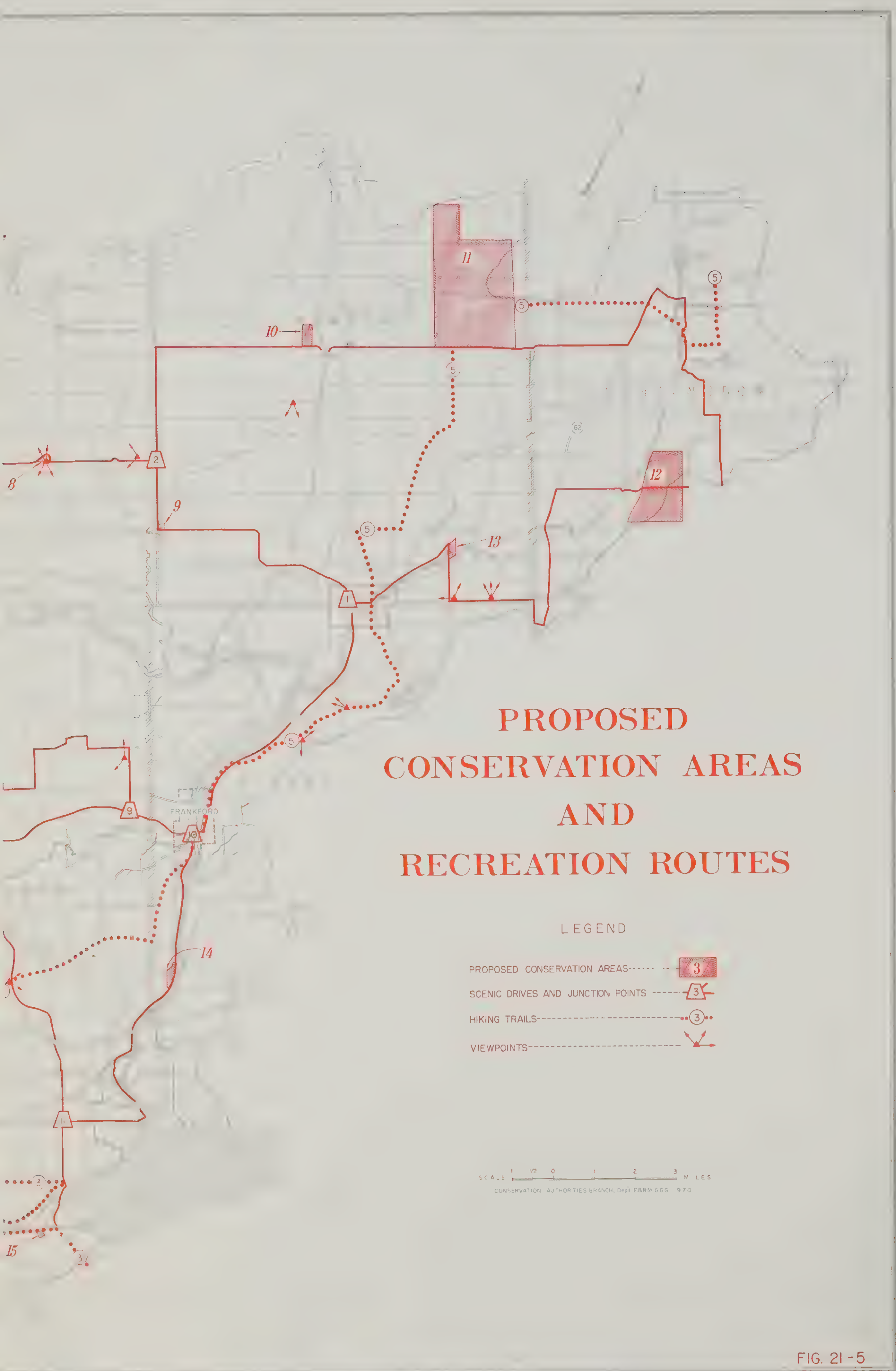

PROPOSED CONSERVATION AREAS AND RECREATION ROUTES
LEGEND
PROPOSED CONSERVATION AREAS
SCENIC DRIVES AND JUNCTION POINTS
HIKING TRAILS
VIEWPOINTS
FRANKFORD
SCALE 1 1/2 0 1 2 3 MILES
CONSERVATION AUTHORITIES BRANCH, Dep't E&RM

FIG. 21-5

Section 22
LAND RESOURCE AVAILABILITY

Prior to the implementation of any remedial measures, the Authority will undoubtedly have to consider the varied interests of residents and non-resident land owners, in addition to the physical characteristics of the soil in the area.

Land acquisition for various Authority projects will be influenced to a great degree by the following conditions.

1. The demand for rural-type holdings, private recreational areas and the associated land speculative atmosphere in the Lower Trent Authority will affect land prices for public projects in the Authority. This latter aspect is readily apparent in the southern portion of the Authority due to its proximity to rapid transportation facilities.

2. The agricultural segment of the Authority is noticeably affected by this non-resident demand for land, and many mixed-farm type operations have been sold for non-farm purposes. On the other hand, highly specialized farm operations, such as tobacco farms and tree-fruit orchards have remained intact for the most part. However, speculation with accelerated land prices could hinder farm expansion possibilities.

The farming communities in the north and north-eastern segments of the Authority have not at present been overly subjected to non-farm acquisitions. In some instances farm consolidation acquisitions have taken place. Furthermore, recent farm purchases for co-operative type farm operations have taken place in the north-eastern segment of the Authority.

3. In areas where the agricultural capability of the land cannot support viable farms, reforestation projects associated with wildlife areas should be considered by the Authority. Some of these areas have not been subjected to private demands and hence may be developed as public projects.

Section 23

PURPOSE OF THE PLAN

In order to solve as many as possible of the problems presented and implement the recommendations of this report without delay but within the financial competence of the participating municipalities it is necessary to adopt a Conservation Plan. This plan is intended to achieve a number of objectives.

(1) To define Authority policy so as to serve as a guide to the Authority in exercising its powers under The Conservation Authorities Act, 1968.

(2) To provide for the orderly implementation of measures to ensure the maximum benefit to society of the land, forest, water, wildlife and recreational assets of the Lower Trent Region.

(3) To provide a basic framework within which more detailed conservation planning can take place.

(4) To ensure stable budgeting by the Authority and the participating municipalities.

(5) To assist with the orderly development of urban and rural planning by the member municipalities.

(6) To assist in the integration of Authority action with that of other agencies to achieve the most effective and economical total conservation program for the Lower Trent Region.

Section 24
BASIS OF PLAN

The Conservation Plan is based on studies and analyses carried out by the Conservation Authorities Branch of the Department of Energy and Resources Management. Details of the studies are contained in Volumes I and II of the Lower Trent Region Conservation Report. Some of the more important considerations are as follows:

(1) The Lower Trent Region is an area composed of municipalities with separate jurisdictions, yet to some degree dependent on one another, and all closely associated with the natural resources of the watershed.

(2) Urban development and permanent rural non-farm development in the Authority will be concentrated in the southern area lying within the municipalities fronting on Lake Ontario. In the northern part of the Authority permanent non-farm growth will be concentrated in Hastings, Campbellford and Stirling.

(3) Demands for cottage sites and recreation opportunities will be most concentrated in the area along the Trent River, Rice Lake, Lake Ontario and around the smaller lakes in the watershed. A number of areas along rivers have been committed to cottage development prior to the imposition of Subdivision Control.

(4) The Authority's resource management objectives can be carried out successfully only if member municipalities co-operate by adopting land-use regulations such as subdivision policies, zoning by-laws and Official Plans which are consistent with Authority policies.

(5) The activities of the Authority will be closely co-ordinated with those of other resource agencies of the local, federal and provincial governments.

(6) The multi-use principle will apply in the development of Authority projects.

(7) The Authority will organize its activities in such a manner that as many persons as possible of the general public can participate actively.

(8) The Authority will receive local municipal financial support sufficient to qualify the Authority for a 70 per cent provincial grant under The Conservation Authorities Act, 1968.

Section 25
DEVELOPMENT POLICY

1. General Policies

The general policies governing all developments of the Lower Trent Region Conservation Authority are as follows:

(a) Management of all existing natural resources must be compatible with the needs and demands of the population and the growth and development of the municipalities.

(b) The Authority will co-ordinate its activities with other agencies concerned with resources, such as the Department of Lands and Forests, Agriculture and Food, Municipal Affairs, and Highways and the District Health Units and Ontario Water Resources Commission.

(c) The Authority will encourage local municipalities and planning boards to adopt land-use regulations, and will endeavour to have incorporated within these regulations policies which are consistent with the resource management objectives of the Authority.

(d) The Authority will prepare and register fill and construction regulations under the provisions of Section 26 of The Conservation Authorities Act, 1968, and co-ordinate these with Official Plans and zoning by-laws. Top priority will be given to urban or urbanizing areas and areas of intense cottage development.

(e) The Authority will encourage and participate actively in converting marginal and submarginal land to more productive uses, including recreation, with a view to improving the overall economy and resource management of the watershed.

(f) The principle of multiple land use will be recognized and particularly in areas of higher population densities.

(g) The preservation of the natural environment including areas of natural, scenic, biological and historic interest will be included in the Authority's program of resource management.

(h) In co-operation with other interested agencies, the Authority will endeavour to ensure adequate stream flows and the improvement of the quantity and quality of surface water supplies.

(i) The financial levy in any year to a member municipality shall not exceed 0.3 mills on the provincial equalized assessment, except where the municipalities concerned request a special project and are prepared to assume the Authority's share of the cost.

(j) Initially, the Authority will emphasize the acquisition of lands required for its various projects, and limit its expenditures on actual development.

(k) The Authority will establish advisory boards in order to enlist the skills and interests of qualified citizens as well as those of Authority members.

(l) The Authority will establish an active educational program in order to communicate to all residents, of all ages, in the watershed, an understanding of the Authority's aims, objectives, and technical and financial assistance programs. This will involve meetings, publications and displays of the technical, financial and integrative roles of the Authority in maintaining and enhancing those amenities which sustain a pleasant environment within which to live, work and play.

2. Water Development Policies

In the development of water management projects the Lower Trent Region Conservation Authority will adhere to the following specific policies:

a. Dams and Reservoirs

(i) Action will be taken, by acquisition or other means as soon as possible, to gain control of lands necessary for the future construction of dams and reservoirs.

(ii) The Authority will initiate a phased program of preliminary investigations, detailed design and construction for those dam and reservoir sites recommended in this report and shown on Figure 5-1, and in addition will investigate other sites as required.

(iii) Where practical, large dams and reservoirs will be designed for multiple-use including flood control, low flow augmentation and recreation.

(iv) Community ponds will be constructed where required for fire protection, irrigation and recreation.

(v) Spillway capacities of dams will be designed to meet local conditions.

b. Channel Improvements

(i) Flood-vulnerable sections of urban areas will be protected by the construction of channel improvements where other methods of flood protection are not feasible.

(ii) Channel improvements will be designed to discharge high flows and withstand high velocities without creating adverse downstream effects.

(iii) Lands necessary for the construction of channel improvements will be acquired or otherwise controlled to prohibit additional developments which would interfere with the eventual proper development of the projects.

c. Sediment Control

(i) The Authority will undertake a program to promote proper land-use practices to reduce siltation of the stream channels and improve streamflows.

(ii) The Authority will promote the installation of sediment and debris basins to protect hydraulic installations where feasible.

(iii) The Authority will undertake a continuing program of measuring the silt accumulation in reservoirs.

d. Land-Use Regulations

(i) Action will be taken to restrict the use of flood-prone areas and valley slopes to such non-intensive uses as agriculture, parks and recreation, through Regulations pursuant to Section 26 of The Conservation Authorities Act, 1968, and through co-operation with municipalities in zoning and development control.

(ii) A systematic program of flood plain and stream valley land-mapping will be initiated to provide information to municipalities and private owners on flood- and erosion-vulnerable lands.

e. Water Quality

(i) A program of periodic water sampling above, at and below settlements, cottage concentrations and factories will be established to assist the Ontario Water Resources Commission in locating and controlling sources of water pollution.

3. Fish and Wildlife Development Policies

The Lower Trent Region Conservation Authority is interested in establishment and maintenance of optimum fish and wildlife and plant communities and will, therefore, pursue the following policies:

(a) Frequent liaison will be maintained with the Lindsay and Tweed District Offices of the Department of Lands and Forests.

(b) Land will be acquired for a combination of wildlife and forest purposes.

(c) Authority-owned land will, wherever feasible, be open to hunting during the open seasons.

(d) Landowners will be advised and/or assisted in such improvements as the installation of Wood Duck nesting boxes and construction of small dams to improve wildfowl habitat.

(e) Action will be taken to acquire, wherever possible, areas having rare species of fauna or flora of special interest to naturalists.

(f) In co-operation with the Department of Lands and Forests an effort will be made to improve "sportsmen-landowner" relationships.

(g) Private landowners will be encouraged to reduce the posting of lands and particularly of trout streams, substituting if possible the issuing of permits to fish or hunt at a daily fee.

4. Recreational Development Policies

The Authority will embark on a phased program of establishing a network of trails, routes and conservation areas, as shown on Figure 21-5, and in doing so will adhere to the following policies:

(a) All developments will be of a high quality, and will be developed with the assistance of professionals, such as landscape architects.

(b) A Conservation Area Classification and Zoning System will be adopted and applied in the development of all Authority lands.

(c) Liaison will be established and maintained with public agencies such as the Department of Lands and Forests, Department of Highways and adjoining Authorities, to ensure a regionally co-ordinated development of recreational resources and facilities.

(d) Member municipalities will be encouraged to incorporate within Official Plans development approvals and zoning by-laws, provisions which will enhance the natural beauty and environment of the watershed.

5. Land Use and Forestry Development Policies

The Authority, with the assistance of the District Offices of the Department of Lands and Forests and the Department of Agriculture and Food, will pursue the following policies to ensure the wise use of land and forest resources:

(a) A phased program of acquisition of submarginal agricultural land will be established with the aim of acquiring not less than 200 acres per year.

(b) Where the lands mentioned in (a) above are best suited for the single purpose of forest management, the purchasing will be first concentrated in the north-east section of the Authority.

(c) Purchases will be such that consolidated blocks of property are eventually created.

(d) Lands having small ponds, stream shore lines and wetlands as major features will not be acquired solely for forest production, but will be developed for combined forestry, wildlife and other compatible uses.

(e) Private land advisory and assistance programs will be set up to promote:

(i) better drainage systems;

(ii) erosion controls through proper cultivation practices, and the establishment of grassed waterways;

(iii) stream-bank stabilization and improvement through the establishment of vegetative cover and protection from livestock;

(iv) the creation of windbreaks and shelterbelts;

(v) the re-establishment of permanent pastures on areas designated in this report; and

(vi) the reforestation of specific areas on private lands designated in this report.

Section 26
DEVELOPMENT PRIORITIES

The following priorities have been established after due consideration of the background studies carried out by the Conservation Authorities Branch, the development policies of Section 25 and the financial capabilities of the Authority. The priorities cover a five-year period, but the projects have been selected within a broader, long-range program. The priorities will be adjusted from time to time as conditions warrant, and a complete review will be carried out after the first five years.

These priorities must be read in conjunction with the following maps:

Fig. 5 - 1 Surface Water Resources

Fig. 15 - 1 Special Land Uses and Erosion Conditions

Fig. 21 - 1 Location of Grass Waterways

Fig. 21 - 2 Recommended Authority Forest and Private Land Improvement Areas

Fig. 21 - 3 Existing and Recommended Areas of Special Interest for Wildlife Management

Fig. 21 - 4 Recommended Cottage Development

Fig. 21 - 5 Proposed Conservation Areas and Recreation Routes

1. General Programs

There are a number of recommendations within this report, which do not involve major expenditures, but which are, nevertheless, of major importance to the overall resource management objectives of the Lower Trent Region Conservation Authority.

Therefore, the Authority will take steps to have the following programs implemented immediately:

(a) The establishment of advisory boards to propose and expedite the consideration of Authority programs. This will include an Environmental Management Advisory Board which will assess and advise upon the overall effect upon the environment of all proposed developments, including Authority projects, in the watershed.

(b) The notification to the Ontario Water Resources Commission and other appropriate authorities, of the urgent need to remove pollution from the following sources:

(i) municipal sewage treatment facilities at Trenton;

(ii) various sources at Hastings and Campbellford which make the river unfit for swimming;

(iii) inadequate sewage lagoons at Stirling;

(iv) suds from the Bata Shoe Company at Batawa;

(v) Domtar pulp mill at Trenton;

(vi) unidentified sources on the west side of the Trent River at Trenton;

(vii) unidentified sources at Lakeport;

(viii) unidentified sources on Breakaway Creek and Butler Creek above and below Highway No. 2;

(ix) garbage and other wastes on Killoran Creek;

(x) plant labelled "Rex Chemicals" at Brighton;

(xi) plant labelled "Saine Chemicals" at Colborne;

(xii) various cheese factories in the Region and

(xiii) animal waste disposal sites on farms.

(c) In co-operation with the Department of Lands and Forests, investigation, and if found feasible, the implementation of the following programs:

(i) the acquisition and development of a section of a trout stream to demonstrate improvement of fish habitat with deflectors and other devices;

(ii) furtherance of the Department of Lands and Forests program to acquire and develop the Murray Marsh Wildlife and Recreation Area and

(iii) the establishment of liaison among agencies and private landowners, with the intent of securing agreement for fishing, hunting, motor-tobogganing and hiking trails on private land.

(d) The adoption of a Conservation Areas Classification and Zoning Scheme as a tool for the planning, development and management of all conservation areas.

(e) The establishment of a working liaison with member municipalities, to review the adequacy of present land-use planning regulations as they may affect conservation policies and objectives; and the provision of assistance in formulating policies and land-use regulations consistent with Authority policy, particularly in flood-prone areas, areas of unusual natural beauty and lakeshores.

(f) The establishment of an active educational program in order to communicate to all residents of all ages in the watershed an understanding of the Authority's aims, objectives and technical assistance programs.

2. Detailed Programs

The detailed projects and programs of the Authority for the first five-year period are set out below. They are classified as either Continuing or Specific, depending on the length of time required for completion. The notation in brackets refers to the dominant purpose of the program.

Continuing Programs

(Water) (1) The instituting of an expanding network of stream and precipitation gauging including the recruitment of gauge readers, investigation of sites and establishment of stations.

(Water, Land) (2) The establishment of a continuing program of flood plain and valley land mapping, resulting in fill and construction regulations covering these areas under the provisions of Section 26 of The Conservation Authorities Act, 1968. The priority of areas to be mapped and regulated is as follows:

(i) Brighton Town;

(ii) Colborne;

(iii) Hastings;

(iv) Trenton; and

(v) areas of intense cottage or residential development.

(Water) (3) The establishment of a water sampling program in conjunction with the Ontario Water Resources Commission, concentrating on areas of permanent residential or industrial development and cottage communities.

(Wildlife) (4) The establishment of a program to provide Wood Duck nesting boxes and advice on the construction of small dams to improve wildfowl habitat to private owners of land.

(Forestry, Wildlife) (5) The initiation of a continuing program of acquisition of lands suitable for management as combined Forestry and Wildlife areas: Table 26-1 gives the priorities and a brief description of lands suitable for these purposes. Approximate locations are shown on Figures 21-2 and 21-3.

(Recreation) (6) The initiation of a continuing program of acquisition of lands suitable for the development as multiple-purpose conservation areas: Table 26-2 gives the priorities and a brief description of the site while Figure 21-3 indicates the locations.

(Recreation) (7) The initiation of an expanding network of hiking trails through public ownership or agreement with private landowners as combined use corridors and the publishing of guide books.

(Recreation) (8) The laying-out of scenic drives and scenic "circle" routes with roadside facilities and compiling of information for eventual publication of a route guide book.

(Land) (9) The establishment of a program for grassed waterways construction, pasture land improvement, improvement of cultivation methods, using a combination of the following methods:

(i) demonstration projects established and maintained by the Authority in several areas;

(ii) provision of technical and financial assistance to private landowners and

(iii) organization of comprehensive small watershed projects to demonstrate proper land management.

(Land) (10) Initiation of a program of technical and financial assistance to private owners of erosion-prone lands along the banks of creeks in order to prevent further deterioration of the banks.

(Wildlife) (11) Co-operation with the Department of Lands and Forests in stocking those portions of streams which are suitable and open to public fishing.

Specific Programs

The following specific projects will be carried out in the order listed:

(Water) (1) Reconstruction of the mill pond reservoir at Warkworth.

(Water) (2) Construction of channel improvements at Frankford.

(Water) (3) Establishment of a flood warning system.

(Water) (4) Pre-engineering study of possible reservoir sites near Orland and Stockdale.

(Water, Wildlife) (5) Establishment of a conservation pond program to provide technical and financial assistance for pond construction.

TABLE 26-1

Purchase Priorities for Combined Forest and Wildlife Management Areas

Priority Group	Township	Location	Attributes	Area (Approx.) Acres
I	Huntingdon	Moreland Lake Area	a. forested b. excellent deer habitat	960
I	Huntingdon	White Lake Area	a. forested b. deer habitat c. upland game	550
I	Rawdon		a. waterfowl b. upland game bird habitat c. upland game	600
I	Percy	Lamey Lake Area	a. wildfowl marshes b. control weir required	10
I	Percy	Killoran Lake Area	a. wildfowl area b. replace beaver dam with rock dam c. blast holes in cattails	5
II	Cramahe	Cramahe Hill Area	a. brook trout habitat b. ruffed grouse habitat c. deer habitat	1,600
II	Brighton	Orland Area	a. waterfowl habitat	200
II	Seymour		a. wildfowl habitat b. area of potholes and marsh c. more permanent dam required	10
II	Murray	Murray Canal North Side	a. wildfowl habitat	180

Table 26-2

Purchase Priorities for Conservation Areas

Priority Group	Site No.	Municipality	Name	Area (Approx.) Acres
I		Rowdon	King's Mill	59
I		Brighton Village & Twp.	Proctor Park	88
I	20; 21; 12	Haldimand	Shelter Valley	75
I	7	Seymour	Cedar Island	5
I	11	Rawdon	Rawdon Range	500
I	11	Sidney	Glen Miller Rock	20
I	16	Brighton	The Breakaway	100
I	7	Seymour	Boat Access	2
II	3	Haldimand	Winter Sports	100
II	9	Rawdon	Sugar Shack	100
II	12	Huntingdon	Pancake Hill	50
II	19	Haldimand	Lake Ontario Beach	10
II	1	Alnwick	White Island	25
II	9	Percy	Dartford Pond	75
II	10	Rawdon	Harold	100
II	15	Murray	Murray Canal	25
II	16	Percy	Norham Pond	5

Section 27
IMPLEMENTATION

This plan will be implemented by the Lower Trent Region Conservation Authority in conjunction with the member municipalities and private or government agencies whose activities will have an effect on conservation measures.

Specifically this Conservation Plan will be implemented by the following:

1. successive five-year budgetary programs reflecting the current grant structures, the financial capabilities of the member municipalities and the Development Priorities outlined in Section 26;

2. the integration, wherever possible, of the policies and programs of this Plan with existing and future municipal and regional Official Plans, restricted area (zoning) by-laws and development programs;

3. co-operative action with public or government agencies such as the Department of Lands and Forests and Ontario Water Resources Commission;

4. a program of public relations and conservation education; and

5. Project Plans conforming to this Plan, but outlining in detail specific projects to be undertaken by the Authority and co-operating agencies.

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A. S. L. BARNES, Director, Conservation Authorities Branch

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appendix

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CONTENTS

LOWER TRENT VALLEY CONSERVATION REPORT

VOLUME II – APPENDIX

Introduction

This volume is an appendix to Volume I, Conservation Report and Plan. It contains additional maps, tables and sections of text, valuable to Authority members or others responsible for implementing the Plan, but more technical or detailed than required by the broader readership of Volume I. No attempt is made to provide a connected narrative. Volume II is printed in limited quantity for distribution to those concerned.

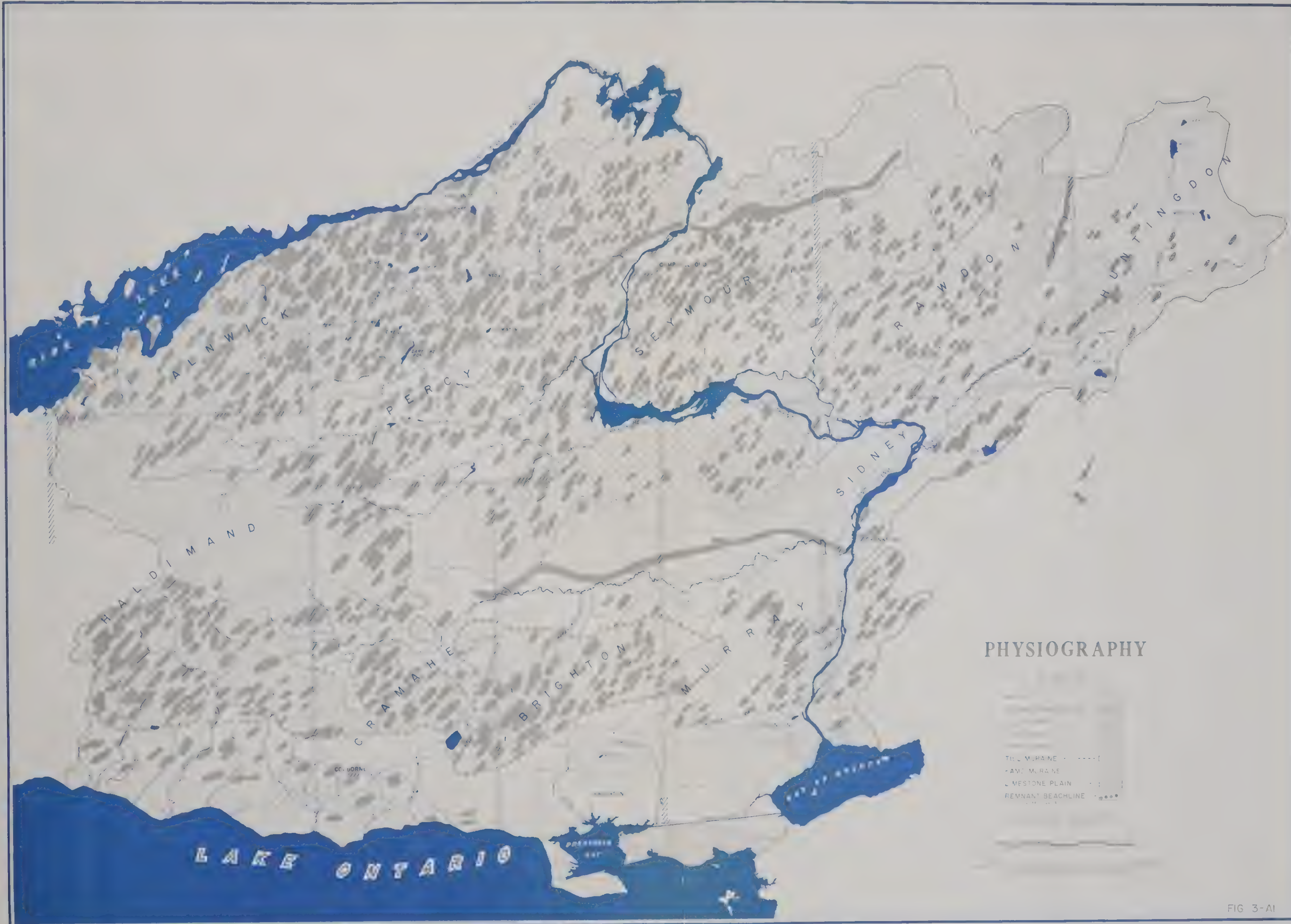

PHYSIOGRAPHY
ALNWICK
PERCY
SEYMOUR
RAWDON
HUNTINGDON
HALDIMAND
SIDNEY
MURRAY
BRIGHTON
CRAMAHE
REMNANT BEACHLINE
LAKE ONTARIO

FIG 3-A1

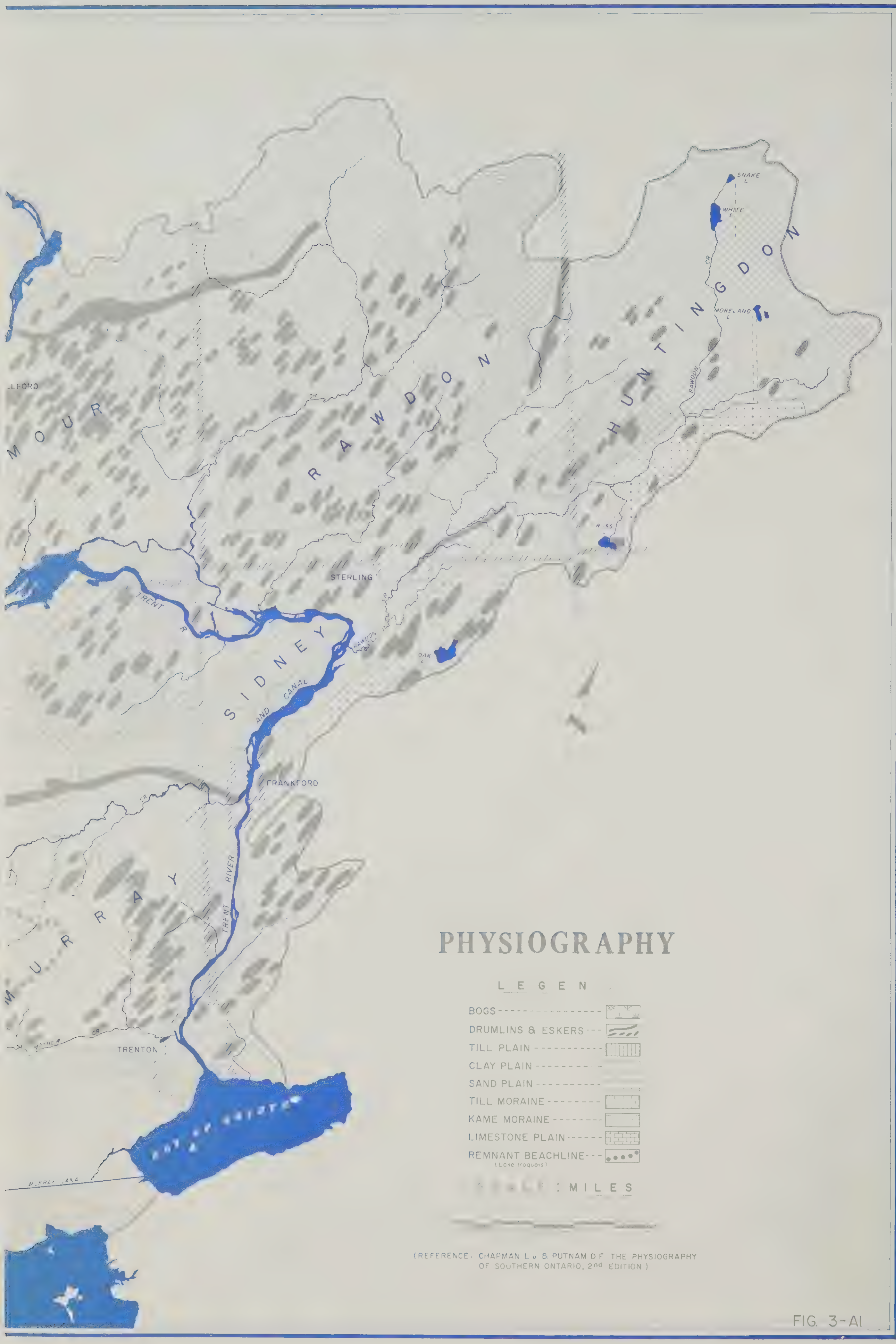

PHYSIOGRAPHY
LEGEND
BOGS
DRUMLINS & ESKERS
TILL PLAIN
CLAY PLAIN
SAND PLAIN
TILL MORAINE
KAME MORAINE
LIMESTONE PLAIN
REMNANT BEACHLINE
(Lake Iroquois)
MILES
(REFERENCE: CHAPMAN L.J. & PUTNAM D.F. THE PHYSIOGRAPHY OF SOUTHERN ONTARIO, 2nd EDITION)
HUNTINGDON
RAWDON
SIDNEY
MURRAY
MOUR
SNAKE L
WHITE L
MORELAND L
OAK L
STERLING
FRANKFORD
TRENTON
TRENT R
TRENT RIVER
AND CANAL
RAWDON CR

FIG. 3-A1

Section A4
LAND RESOURCES

The Local Effect of Logging in Woodlands

Within the authority area surveyed in 1969, 243 acres of woodland were found to have been logged in recent years. Another 307 acres had been cut in the process of clearing land for agriculture.

Aside from the minimal erosion effects of local logging, as previously described, the 1969 survey provided an interesting insight into local logging techniques. These observations revealed a current preference for selective cutting and a mechanized extraction process. The farm tractor is evidently the prominant skidding machine, followed by wheeled skidders. Both suggest that harvesting of woodlots by their owners may be preferred locally over custom cutting, sale of wood by stumpage and outright woodland area sales.

The apparent local preference for selective cutting tends to offset the danger of damage to the residual stand, regeneration and the site itself.

Observations tabulated in the 1969 survey clearly indicated that clear cutting leads locally to damage to residual young trees, to seedlings and to the site. Additionally it has led to the obstruction of small streams with slash and in one case the total obscuring of a small stream flowing through a woodlot. These problems suggest that landowners should retain woodlots rather than sell them outright. Additionally woodlot owners should be more stringent in their contract terms, when allowing outside logging interests to operate on their property, since it is quite apparent that local woodlands can be harvested by their owners without major damage to the stands. The occasional tendency to waste logs and pulpwood cut on local woodlots, by leaving them in the cutover area or at the roadside, should also be curbed.

Section A4
LAND RESOURCES

Table A4-1
PRINCIPAL FOREST CAPABILITIES
(% by Townships)

Township	Class I	Class II	Class III	Class IV	Class V
Alnwick		28.0	72.0		
Brighton	5.4	50.2	37.0		7.4
Cramahe		41.5	58.5		
Haldimand		51.1	40.8	7.8	
Huntingdon		3.4	50.0		46.6
Murray		18.3	68.5	5.5	7.7
Percy		100.0			
Rawdon		46.8	22.4	22.5	8.3
Seymour	0.4	75.8	15.3	5.9	2.6
Sidney		41.1	36.1	19.1	13.7

Table A4-2

CAPABILITY AND LIMITATIONS TO TIMBER USE

Expressed as a Percentage of Total Land of Each Township

Township	Limitations Minimum to Nil	Capability Class II					Capability Class III							Capability Class IV					Capability Class V					Class VI		Class VII	
		D	M	L	W	F	D	M	L	W	F	R	X	D	M	L	W	R	D	M	L	W	R	W	R	W	R
Alnwick	1.0	11.6	13.7	13.7			3.3	27.5	18.0													11.2					
Brighton	2.7	2.9	24.2			4.1	6.0	9.4	1.5	23.2				0.7	3.6	0.7	13.0					6.0			2.0		
Cramahe	2.6	6.1	19.6			0.3	8.5	38.4	1.3	3.7	5.0				10.0		4.5										
Haldimand	4.1	2.7	37.1	2.4			3.4	21.0	8.4	1.6	2.1				7.3	2.6	3.7			2.0	1.0	0.6					
Huntingdon		10.2		0.9	0.1		27.3		26.7	0.1					0.9	0.1	1.9					3.5	28.4				
Murray	0.2	15.3	9.8				15.7	19.0		10.5		3.7		3.1	3.2		6.5	2.2				5.4	3.0	2.3		0.1	
Percy	9.1	55.1		2.0	0.8	4.4	20.1		1.0	2.2					0.1							5.2					
Rawdon		17.5	0.7	3.4			19.8		12.8	6.5			0.7	7.3		8.5	5.0	7.0			2.3	0.9	6.0		1.5	0.1	
Seymour	0.5	26.2		10.6		2.3	27.2		13.8	1.2				2.5		2.5	8.8					1.5	1.6			1.4	
Sidney		19.6	4.5	0.3	1.0		15.6	14.3		13.6			3.4	7.5			5.3	6.0				2.6	5.2			1.1	

D - Dense substrata restricting rooting

M - Deficiency of soil moisture

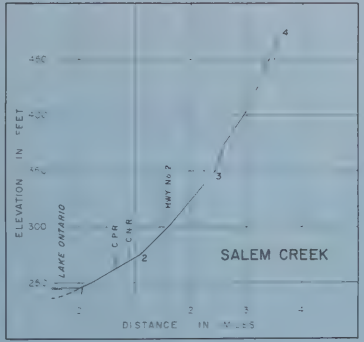
L - Growth limitations due to excessive soil calcium levels

W - Growth limitations due to excessive soil moisture

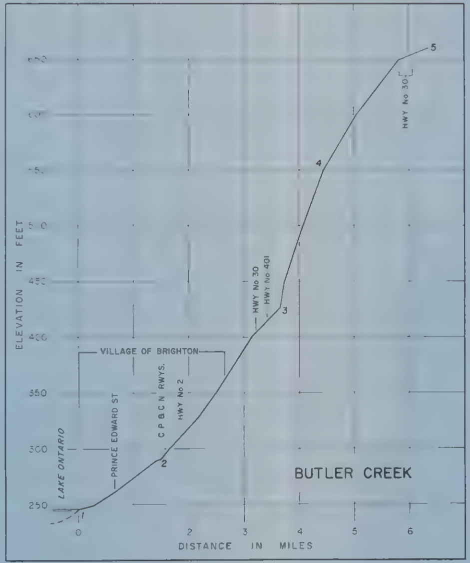
F - Insufficient soil nutrients

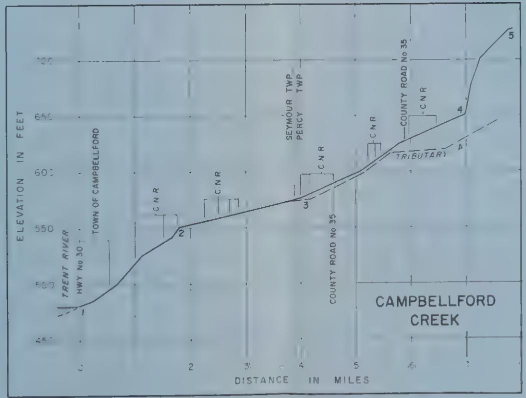
R - Bedrock restricts rooting zones

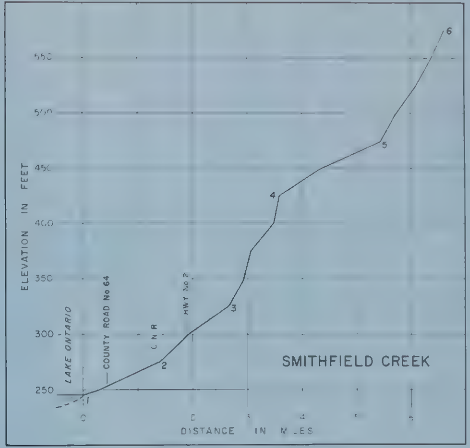
X - Intimate inseparable patterns of "M" and "W"

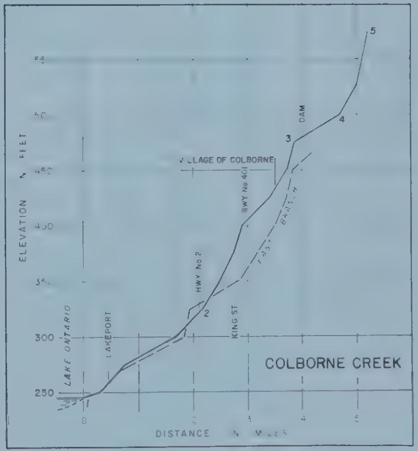


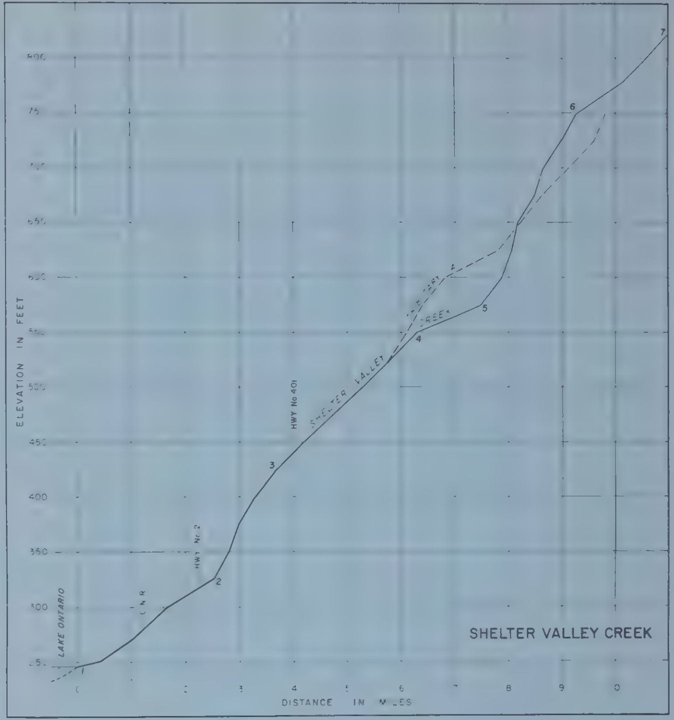
STREAM	FROM POINT–POINT		DISTANCE IN MILES	DIFFERENCE OF ELEVATION	GRADIENT FEET PER MILE
SALEM CREEK	[illegible]	2	1	[illegible]	26 4
SALEM CREEK	[illegible]	3	3	[illegible]	[illegible] 7
SALEM CREEK	3	4	1 2	25	54 2
BUTLER CREEK	1	2	1 5	44	[illegible] 3
BUTLER CREEK	2	3	2 2	35	[illegible] 4
BUTLER CREEK	3	4	0 8	25	[illegible] 3
BUTLER CREEK	4	5	1 8	[illegible]	[illegible] 7
SMITHFIELD CREEK	1	2	1 4	[illegible]	[illegible] 7
SMITHFIELD CREEK	2	3	1 3	[illegible]	[illegible] 5
SMITHFIELD CREEK	3	4	0 9	[illegible]	[illegible]
SMITHFIELD CREEK	4	5	1 8	[illegible]	[illegible] 8
SMITHFIELD CREEK	5	6	1 2	[illegible]	83 3
SHELTER VALLEY CR	1	2	2 5	[illegible]	[illegible] 6
SHELTER VALLEY CR.	2	3	1 2	[illegible]	83 3
SHELTER VALLEY CR	3	4	2 6	[illegible]	[illegible] 1
SHELTER VALLEY CR.	4	5	1 2	[illegible]	[illegible] 8
SHELTER VALLEY CR	[illegible]	[illegible]	[illegible] 8	[illegible]	[illegible] 2
SHELTER VALLEY CR	6	[illegible]	[illegible] 7	[illegible]	[illegible] 2
COLBORNE CREEK	[illegible]	2	2 2	[illegible]	[illegible] 9
COLBORNE CREEK	2	3	6	[illegible]	[illegible] 8
COLBORNE CREEK	3	4	0 9	[illegible]	[illegible] 8
[illegible]	[illegible]	5	0 5	[illegible]	[illegible] 0
CAMPBELLFORD CR	[illegible]	2	[illegible] 8	[illegible]	[illegible] 0
CAMPBELLFORD CR	2	3	2 2	[illegible]	[illegible] 5
CAMPBELLFORD CR	3	4	3 0	75	25 0
CAMPBELLFORD CR	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]











WATER LEVEL PROFILES

AND GRADIENT TABLE

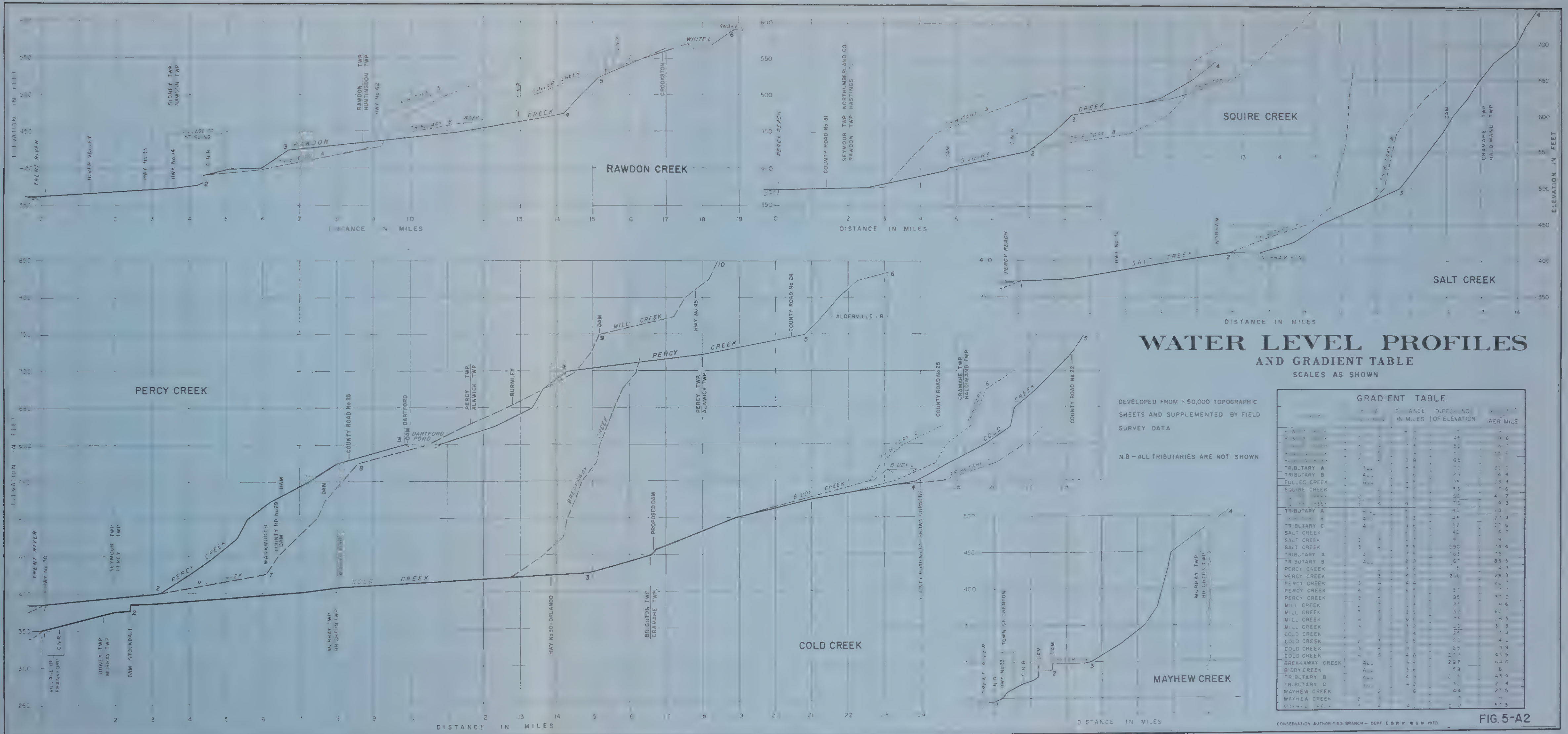
SCALES AS SHOWN

DEVELOPED FROM 1:50,000 TOPOGRAPHIC SHEETS AND SUPPLEMENTED BY FIELD SURVEY DATA

NOTE — ALL TRIBUTARIES ARE NOT SHOWN

FIG. 5-AI

CONSERVATION AUTHORITIES BRANCH — DEPT. E & R M 1970



WATER LEVEL PROFILES

AND GRADIENT TABLE

SCALES AS SHOWN

DEVELOPED FROM 1:50,000 TOPOGRAPHIC SHEETS AND SUPPLEMENTED BY FIELD SURVEY DATA

N.B — ALL TRIBUTARIES ARE NOT SHOWN

GRADIENT TABLE

[illegible]	[illegible]	[illegible]	DISTANCE IN MILES	DIFFERENCE OF ELEVATION	[illegible] PER MILE
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	45	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	3.8	65	[illegible]
TRIBUTARY A	[illegible]		[illegible]	[illegible]	[illegible]
TRIBUTARY B	ALL		[illegible]	23	4.4
FULLER CREEK	ALL		[illegible]	[illegible]	[illegible]
SQUIRE CREEK	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	2	3	[illegible]	50	4.7
[illegible]	3	4	[illegible]	75	9.3
TRIBUTARY A	[illegible]		[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
TRIBUTARY C	[illegible]		[illegible]	27	[illegible]
SALT CREEK	[illegible]	[illegible]	[illegible]	[illegible]	6.7
SALT CREEK	[illegible]	[illegible]	[illegible]	[illegible]	9
SALT CREEK	3	[illegible]	[illegible]	290	[illegible]
TRIBUTARY A	[illegible]		[illegible]	[illegible]	[illegible]
TRIBUTARY B	ALL		[illegible]	[illegible]	83.5
PERCY CREEK	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
PERCY CREEK	[illegible]	[illegible]	[illegible]	200	28.3
PERCY CREEK	3	4	4.4	[illegible]	[illegible]
PERCY CREEK	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
PERCY CREEK	5	[illegible]	[illegible]	85	[illegible]
MILL CREEK	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MILL CREEK	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MILL CREEK	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MILL CREEK	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
COLD CREEK	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
COLD CREEK	[illegible]	3	[illegible]	[illegible]	[illegible]
COLD CREEK	3	4	[illegible]	25	[illegible]
COLD CREEK	4	5	4.6	[illegible]	[illegible]
BREAKAWAY CREEK	ALL		[illegible]	297	[illegible]
BIDDY CREEK	ALL		[illegible]	58	6
TRIBUTARY B	ALL		[illegible]	[illegible]	[illegible]
TRIBUTARY C	ALL		[illegible]	[illegible]	[illegible]
MAYHEW CREEK	[illegible]	2	[illegible]	44	[illegible]
MAYHEW CREEK	2	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	4	[illegible]	[illegible]	[illegible]

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FIG. 5-A2

Section A6
FISH AND WILDLIFE RESOURCES

In order to show the great productivity of Rice Lake and the Trent River which formerly existed, as compared with their present over-fertilization and reduction of fishing potential, it is essential to quote from or summarize former surveys.

These include one report of Charles Fothergill* and two by J. P. Oughton+. Fothergill reported as follows:

Maskinonge (Muskellunge): "attain 35 lbs. — very commonly found from 15-20 lbs.";

Salmon trout (lake trout): "confined to the deep waters with stony or gravelly bottoms.";

Black bass: "very common, almost any quantity of this fish may be taken,";

Eels: "innumerable and grow to an immense size. I have seen them as large as any conger out of the sea and they are the fattest and most delicious — I suppose partly in consequence of the abundance of rice — I ever tasted,";

Perch: "the common kind, in great abundance about the gravelly shores of the islands,";

Gar-pike: "sword-fish — common in the Trent below the high falls." (These must be Healey Falls.)

J. P. Oughton reported as follows:

Muskellunge: none below Lock 6, some between Locks 6 and 7 at Crowe Bay, Trent Bridge, Hastings, Rice Lake (Birdsall Point, Gore's Landing);

Pickerel (walleye): between Locks 6 and 7, Rice Lake (at three points). The initial catching of this fish in Rice Lake occurred between 1915 and 1920.

Largemouth bass: "three points on Rice Lake";

Smallmouth bass: Rice Lake (Birdsall Point);

Sturgeon: "chiefly below Lock 6; a very few between Locks 6 and 7, very few above Lock 7";

Ciscoes (lake herring): Rice Lake (Gores Landing);

Ling: Rice Lake (Gores Landing);

Carp: "They seem to be coming down the (Trent) system from above";

Yellow perch: Rice Lake (Birdsall Point, Gore's Landing).

Oughton further noted concerning the muskellunge that:

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* Fothergill, Charles, *Notes On The Natural History Of Eastern Canada 1816-1837.* Reprinted Trans. Royal Canadian Institute, Vol. XX Part 1, September 1934.

\+ Oughton, J. P. *Report of a Trip Up the Trent River System 1930* (Unpublished), and Game *Fish of the Trent Canal System 1930.*

It seems to be native to the Trent and is probably the most important fish, at least it is the most sought fish because of its size. It is able to give the angler a formidable fight. It attracts a large number of tourists especially in the Rice Lake district, where it is probably the most abundant. Everyone questioned about muskellunge agreed on this one point — that the number of them caught at the present time is much smaller than the past.

Causes of depletion advanced were:

1. Spearing in spring while spawning;
2. Water level in spring going down and the spawn being killed by being left high and dry;
3. Motorboats now making it easier to catch the fish;
4. Illegal fishing: (a) in summer by nets, (b) out of season, (c) taking over the legal limits;
5. Dynamiting, probably rare, but two or three times in the past this has been done in Rice Lake, and
6. Sores on the lungs and in the mouth.

Stream Survey Methods

The procedure here adopted followed closely that used in previous surveys made by the Conservation Authorities Branch in other river systems. The Trent River was known to be warm in summer and suitable only for pike, muskellunge, and bass of the game fish. It was therefore not examined in detail.

The remaining streams in the watershed were examined at "stations" from half a mile to four or five miles apart on each stream course. At all suitable stations collections of the aquatic insects and other invertebrates were made and at most stations collections of fish were also made. The various collections were classified and used in zoning the various sections of the streams. The nymphs of certain species of insects are confined to waters which remain cold and usually clear in summer, such as brook trout waters. Certain species of the genus *Baetis* of the mayflies are the most useful for this purpose. The species *Baetis Vagans* is is a particularly useful one. Other species of various genera are indicators of permanent flow. The genus *Hydropsyche* (one of the Caddisflies) is the most useful for this purpose. Other species are indicators of severe pollution. In general either no fauna or very large populations of very few species are indications of pollution, while an unpolluted stream has moderate numbers of a large variety of species. The fish collections and records from maximum-minimum thermometers (which were left in the streams for periods of one week or more) substantiated the findings.

The present criteria were developed from much more intensive year round research carried out by Dr. F. P. Ide of the Department of Zoology, University of Toronto. * The analysis by J. B. Hallam+ of previous surveys by this Branch was

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* Ide, F. P., *The Effect of Temperature on the Distribution of the Mayfly Fauna a Stream.* University of Toronto Studies, Biology 39, Ontario Fisheries Research Laboratory Publication 50, 1935; and *Quantitative Determination of the Insect Fauna of Rapid Water.* University of Toronto Studies, Biology 47, Ontario Fisheries Research Laboratory Publication 59, 1940.

\+ Hallam, J. B., *Habitat and Associated Fauna of Selected Species of Fish in Ontario Streams,* M. A. Thesis, University of Toronto, 1954.

also useful. Many of the stations were examined only once. It was therefore necessary to rely partly on deductions made from the presence or absence of species known to be reliable indicators.

Table A6-1
CARP FISHERY

Rice Lake and Trent River

(Data from Department of Lands and Forests Records)

YEAR	MONTHS FISHED	POUNDAGE RICE LAKE	POUNDAGE TRENT RIVER
1964	3	19,240	1,661
1965	3	10,700	
1966	2	7,150	
1967	1	5,400	
1968	4	15,750	
1969	5	56,995	

List of Fish of the Region

The information contained herein applies primarily to the following Northumberland County areas:

1) The streams flowing directly into Lake Ontario, of which Shelter Valley Creek, Haldimand township, is a good example (Column A in Table A6-2);

2) The Trent River, including some of the tributary streams, from the towns of Trenton to Hastings (Column B in Table A6-2);

3) Rice Lake (Column C in Table A6-2); and

4) Otonabee River system (Column D in Table A6-2).

A total of 42 species are included in Table A6-2, and it is believed that this list probably includes 75 per cent or more of the fish fauna occurring in the study region. The remaining 25 per cent or less (13 species or fewer) would include such species as *Morone Americana* (Bay of Quinte), *Esox a. vermiculatus* , some species of redhorse suckers of the genus *Moxostoma,* small or diminutive species such as *Schilbeodes gyrinus,* some *Cyprinidae* (minnows), and some of the smaller *Percidae,* the darters. The following additional species have been recorded from the Crowe River which drains into the Trent River but not from this study area: *Notropis cornutus, Fundulus diaphanus, and Labidesthes Sicculus.*

This particular area of Ontario has been relatively well known for many years. Fothergill's early comments on the eel are of particular interest.

The Trent River is also well known to anglers. However, no detailed and comprehensive ichthyological survey has been undertaken.

The information on Shelter Valley Creek resulted from a survey conducted by the Ontario Water Resources Commission during July 19 to 21, 1966. Shelter Valley Creek is located just east of Grafton Station (CNR), Haldimand township.

It seems reasonable to assume that other streams, having similar physical characteristics, flowing into Lake Ontario between Shelter Valley and Trenton, would have a similar fish fauna. Baltimore creek, which is just westward of the study area, is known to contain *Notropis Cornutus* but this species has not been positively reported from anywhere within the study area.

Table A6-2 contains in tabular form the distributional information on the fishes recorded from the study area. The water body concerned is indicated by the vertical columns A, B, C. and D. The source of the information is indicated by the numerals 1 to 6 after X (i. e. , X3), which indicates the presence of that species in the water body indicated by the column. Although the Otonabee River is outside the study area, it is included to indicate that except for *Pimephales promelas* , and possibly *Cottus cognatus,* no species occurred there that was not found downriver in Rice Lake or the Trent River proper.

Table A6-2

FISHES OCCURRING IN VARIOUS PARTS OF NORTHUMBERLAND COUNTY, ONTARIO

(Sources of records shown*)

		A	B	C	D
		Trib. streams Lake Ontario	Trent R. Trenton to Hastings and tributaries	Rice L.	In Otonabee drainage
1	*Petromyzonidae (larvae)*	X4		?	
2	*Acipenser fulvescens*		X2		X2
3	*Lepisosteus osseus*		X3		
4	*Salmo gairdneri*	X4			
5	*Salvelinus fontinalis*	X5			
6	*Coregonus (Leucichthys) artedi*			X2	
7	*Umbra limi*		X4		
8	*Esox lucius*		X3		
9	*Esox masquinongy*		X(in part)	X5	
10	*Cyprinus carpio*		X3	X3	
11	*Chrosomus eos*	X4	X4		X4, 6
12	*Chrosomus neogaeus*	X5			X4, 6
13	*Hybognathus hankinsoni*				X4
14	*Notemigonus crysoleucas*			X4	
15	*Notropis heterodon*			X4	
16	*Notropis Heterolepis*		X4		X4
17	*Notropis hudsonius*			X4	
18	*Pimephales notatus*	X4			
19	*Pimephales promelas*				X4, 6
20	*Rhinichthys atratulus*	X4			X4, 6
21	*Rhinichthys cataractae*	X4			
22	*Semotilus atromaculatus*	X4			
23	*Semotilus corporalis*		X4		
24	*Semotilus margarita*		X4		
25	*Catostomus commersoni*	X4		X2	
26	*Ictalurus lacustris*		X2		
27	*Ictalurus natalis*		X5		
28	*Ictalurus nebulosus*		X4	X5	
29	*Anguilla rostrata*			X1, 3	
30	*Lota lota*		X2	X2	
31	*Culaea inconstans*	X4			
32	*Percopsis omiscomaycus*			X4	
33	*Ambloplites rupestris*			X5	
34	*Lepomis gibbosus*		X4	X5	
35	*Micropterus dolomieui*	X5	X5	X5	X4
36	*Micropterus salmoides*		X5	X5	
37	*Perca flavescens*		X5	X4	
38	*Stizostedion vitreum*		X5	X3, 5	
39	*Etheostomia nigrum*	X4	X4		
40	*Percina caprodes*		X4		
41	*Cottus bairdi*	X4			X4, 6
42	*Cottus cognatus*	?			X4

Table A6-2 (con't.)

*1 Fothergill report (pre-1900)
2 J. Oughton reports (0=formerly)
3 Ont. Govt. reports (OWRC, L & F, etc.)
4 Specimens on hand (Royal Ontario Museum)
5 Specimens seen and identity checked
6 Dept. of Planning and Development report (1960)

Table A6-3

FISH SPECIES IN SHELTER VALLEY CREEK, HALDIMAND TWP., NORTHUMBERLAND COUNTY, BY ONTARIO WATER RESOURCES COMMISSION JULY 1966

1 *Petromyzonidae* larvae (probably Petromyzon)*
2 *Salmo gairdneri**
3 *Salvelinus fontinalis**
4 *Chrosomus eos**
5 *Chrosomus neogaeus**
6 *Pimephales notatus**
7 *Rhinichthys atratulus**
8 *Rhinichthys cataractae**
9 *Semotilus atromaculatus**
10 *Catostomus commersoni*
11 *Culaea inconstans**
12 *Micropterus dolomieui**
13 *Etheostoma nigrum**
14 *Cottus bairdi**

*Specimens retained by Royal Ontario Museum.

List of Amphibians and Reptiles

The following list is taken from the field checklist of amphibians and reptiles known to occur in Presqu'île Provincial Park, in the south-eastern part of the Region.

Amphibians and reptiles are cold-blooded vertebrates. That is, they have back-bones (or vertebrae) and their body temperature varies with their surroundings. They do not maintain a constant body temperature as do birds and mammals.

Amphibians usually have smooth moist skins, and their young are quite unlike the adult. On the other hand, reptiles have a dry scaly skin, and the young reptiles are miniatures of the adult form.

Amphibians known to occur in the Lower Trent Region include five salamanders and eight frogs and toads. Reptiles are represented by four turtles and snakes. There are no poisonous snakes found in this area. The only venomous snake known in Ontario is the Massassauga Rattlesnake, and the range of this shy reptile stops over 75 miles west of the Region.

Amphibians

Salamanders

Red-spotted Newt	*Notophthalmus viridescens*
Mudpuppy	*Necturus maculosus*
Blue-spotted Salamander	*Ambystoma laterale*
Spotted Salamander	*Ambystoma maculatum*
Red-backed Salamander	*Plethodon cinereus*

Toads and Frogs

American Toad	*Bufo americanus*
Northern Spring Peeper	*Hyla crucifer*
Eastern Gray Tree Frog	*Hyla versicolor*
Bullfrog	*Rana catesbiana*
Green Frog	*Rana clamitans*
Wood Frog	*Rana sylvatica*
Leopard Frog	*Rana pipiens*
Pickerel Frog	*Rana palustris*

Reptiles

Turtles

Common Snapping Turtle	*Chelydra serpentina*
Blandings Turtle	*Emydoidea blandingi*
Map Turtle	*Graptemys geographica*
Midland Painted Turtle	*Chrysemys picta*

Snakes

Eastern Garter Snake	*Thamnophis sirtalis*
Northern Red-bellied Snake	*Storeria occipitomaculata*
Northern Brown (Dekay's) Snake	*Storeria dekayi*
Northern Water Snake	*Natrix sipedon*
Eastern Milk Snake	*Lampropeltis triangulum*

Section A11
FOREST RESOURCES AND RELATED ACTIVITY

1. Extent and Nature of the Resource

a. Forest Cover Types

The term "Forest Cover Types" refers to those combinations of tree species occupying the ground, with no implication as to whether these types are temporary or permanent. A slightly modified form of this system, drawn up by the Society of American Foresters, was used in the survey of the Mississippi Valley Conservation Authority.

The forest cover of the Authority was surveyed in 1968 by using several sampling methods in which typical blocks of land were studied, or by traversing the more remote areas. Coverage was expanded by using air photo interpretation.

Woodlots considered by their owner as a single entity were divided during survey, where there were clear differences between the type and age class found in them. Conversely, where property boundaries were not marked, as around the borders of bogs, cover types extending across property boundaries were considered as a unit because the species combination and age class remain constant throughout. Generally it can be said that much of the Authority's forest cover on private lands, when examined for its species content alone, exhibits a fragmentation of cover types.

A description of the main cover types in relationship to local site conditions follows:

i. Dry Site Types

TYPE 4: Aspen usually functions as a typical pioneer type of forest in southern Ontario, appearing after clear-cutting, over-grazing, or fire. Commonly it invades abandoned fields and pastures. It is sometimes considered a less valuable form of cover, yet it can have many uses. It grows on droughty soils as well as those that are wet throughout a good part of the year, although it avoids the wettest swamps. A sister type, Poplar-Oak (Type 4a), is frequently mapped in southern Ontario, occupying similar acreages and sites. Aspen's associates may be largetooth aspen, red cherry, white elm, paper birch and balsam poplar, the latter sometimes forming pure stands on moist sites. An understorey of dogwood or spruce and balsam fir on wet sites, or tolerant hardwoods on drier sites, is frequently present.

Under such conditions, more valuable hardwood species such as basswood can grow successfully at levels of light as low as 13 per cent of full light, although better growth performances will occur between 25 and 45 per cent light levels. White elm will grow well under similar conditions at light levels from 45 per cent of full light upward.

Poplar woodlots, if they have an insufficiently wellstocked secondary component of more useful species, can be used as nurse crops for higher value coniferous species such as white spruce and white pine, depending on the degree of silviculture manipulation of the overstorey. These can be

planted under the old canopy to the benefit of the stand, although the removal of ground level bracken fern, a common sub-vegetation component of aspen stands, is advocated.

In the case of white pine, this method of stand improvement and replenishment will discourage white pine weevil activity without inhibiting normal height growth of white pine, so long as a level of 55 per cent of normal light intensity can be maintained in the stand. In cases where underbrush occurs in the understorey, some mortality can be expected. Once the pine seedlings grow above this layer, however, mortality will decrease and growth will increase.

Using the poplar overstorey as a nurse crop for white spruce is also a proven method of stand improvement, which requires the removal of up to 60 per cent of the overstorey. This particularly favours spruce which have grown in the aspen to the point where their crowns are immediately below and in direct contact with the aspen crowns.

Under some circumstances, the forest manager may wish to favour commercial aspen culture by increasing this species' suckering ability. This can be done with different treatments such as scarification of the duff layer, bracken fern removal, controlled burning and specialized cutting methods.

Silvicultural methods favouring aspen are used because of its potential in the pulp, paper (newsprint filler, corrugated papers), building board (hardboard and insulation board), and particle board industries. It has the ability to give high yields of pulp fibre easily, and low density chips which, under pressure, form a compact board with great strength due to improved chip-to-chip bonding.

TYPE 4A: Poplar-oak is a residual type on light soils following logging and fire. This type usually consists of trees of white, red and sometimes bur oak, which have survived due to their resistance to fire, and poplar which has seeded in later. The site is usually a white pine site and scattered trees of this species frequently occur, with patches of good white pine reproduction appearing throughout the area.

TYPE 6: Paper birch is a type of forest cover that is universal throughout the Northern Forest Region. Paper birch pioneers on burnt and clearcut areas, and is succeeded by spruce-fir or the northern hardwood group types, and sometimes by white pine. It also merges with aspen more than any other type. Other associates are balsam fir, white spruce, white pine, yellow birch, hemlock, red maple, northern red oak, and basswood. There is frequently an understorey of conifers or hardwoods.

TYPE 8: White Pine-red oak-white ash, is a type that quite often occurs on fairly warm and dry sites within the Northern Forest. It often follows white pine that establishes on old fields, and occurs also on land never cleared for agriculture. It may be permanent in some places but in general tends toward the white pine-hemlock type or the northern hardwood-hemlock group.

TYPE 9: White pine, although occupying a prominent economic position in southern Ontario's forest area during the period of early settlement, now commonly occupies a lesser position. There is frequently the problem of low quality stems and form in present-day natural stands.

White pine's associates on light soils are red pine, grey birch, black cherry, white ash, red oak, sugar maple, basswood and hemlock.

White pine is often the first type to occupy abandoned agricultural land. It approaches permanence on sandy soils. On heavier soils it is usually succeeded by sugar maple-beech-yellow birch, red oak-basswood-white ash, and white spruce-balsam fir-paper birch. It is considered to be a long-lived temporary type that seldom succeeds itself except after fires or under special cultural treatment.

TYPE 10: White pine-hemlock commonly occurs in small scattered stands with these two species predominant but with many minor associate species. The principal ones are beech, sugar maple, basswood, red maple, yellow birch, black cherry, white ash, paper birch, northern red oak and white oak. Occasionally this type is the result of long continuous grazing of farm woods containing scattered pine and hemlock in mixture with hardwoods.

TYPE 11: Hemlock grows in small stands where its associates are similar to those in Type 10. As a cover type it frequently associates with northern hardwood stands.

TYPE 13: Sugar maple-basswood is another cover type that appears on rich upland loamy soils; hence has also experienced heavy clearing pressure in favour of agriculture. It appears frequently on lakeshores. Along with the predominant species, white elm, yellow birch, white pine and red oak, are to be found as associates.

TYPE 14: Sugar maple, and its related Type 57, beech-sugar maple, are commonly observed occupying locations in heavily developed agricultural areas. Both types favour deep, fertile, well-drained soils with good moisture conditions. At times sugar maple stands may have a small proportion of yellow birch, white ash, red and white oak. They sometimes owe their vigour to cultural practices favouring maple syrup production and may also be found in small patches.

Both types have commonly experienced considerable cutting and clearing pressure since settlement.

TYPE 46: Eastern red cedar has a wide range in North America and can grow under varying climatic conditions, being able to withstand extremes of drought, heat, cold and exposure. Depth of soil, however, controls its growth ability. Strangely, although it will grow on alkaline sites, it is less tolerant of highly alkaline situations than other drought-hardy trees and shrubs. It owes its ability to spread to the fact that its fruit is food for small mammals and many species of birds. Seedlings are slow-growing but will appear on acid sites. It is rather intolerant of shade, preferring

open canopy forest stands or full sunlight. It does not reproduce naturally by sprouting or suckering.

Red cedar usually occupies abandoned pastures and fields in dry uplands. It can grow well on good sites, but is equally common on limestone outcrops and other shallow soils. It is considered to be a temporary type that is succeeded by various hardwoods. Locally, red cedar sites are quite often heavily grazed by cattle which delays the normal process of succession by hardwoods.

TYPE 50: White oak is commonly found on dry upland sites in small stands with white oak predominant over such associate species as red oak, bur oak, shagbark and bitternut hickory, white ash and largetooth aspen.

TYPE 51: Red oak-basswood-white ash as a cover type is usually observed on deep, fertile, moist, well-drained soils. Its common associate species are red maple, yellow birch, the aspens, sugar maple, paper birch, and beech.

TYPE 52: Red oak commonly covers small acreages, tending to act as a pioneer species in Canada on warm dry sites. This may frequently happen in association with paper birch.

TYPE 59: Ash-hickory is a cover type found throughout the deciduous forest area on poorly drained soils. It may occur on any cut over area. The predominant species are white ash, hickory and white elm. It is not uncommon to observe stands with heavy components of either white ash or hickory.

ii. Wet Site Types

TYPE 21: White spruce-balsam fur-paper birch, is more commonly found in the northern forest of Ontario. It is, however, also found in some areas around the Great Lakes. The first two are key species, although they do not always predominate. The aspens, white pine, balsam poplar, northern white cedar, sugar maple, black ash, and yellow birch, also occur in such stands as associates. Balsam fir is frequently more prolific in this type than white spruce.

TYPE 24: White cedar is a cover type that occurs on the much soils of swamps where drainage is slow, but it avoids strongly acid swamps or stagnant bogs. Under these conditions its common associates are black ash, white elm, tamarack, red maple, yellow birch, hemlock, white pine and white birch. It is a characteristic type on seepage areas.

Where lime is plentiful, white cedar extends to droughty upland slopes, where it tends to form pure stands. It also occurs on the shallow soils of limestone plains. All of these conditions are quite typical of the Authority.

TYPE 25: Tamarack is a type grown commonly in wet swamps, chiefly on peat soils, but muck soils are also occupied. Its common associates are black spruce or white cedar or, less frequently, both. Other associates, mostly subordinate, include red maple, black ash, and trembling aspen. It is succeeded by black spruce on poorly drained peat or by white elm on better drained, less acid soils.

TYPE 26: Black ash-white elm-red maple occurs on moist to wet muck and peat soils, and is found in swamps, gullies, and small depressions of slow drainage, or in elongated areas along small sluggish streams. It frequently grades into white cedar on wetter sites. Black ash is considered to be the indicator species of the type.

Associate species are balsam poplar, balsam fir, yellow birch and, less commonly, white pine, tamarack, white cedar and basswood.

TYPE 60: Silver maple-white elm and its closely related Type 60A, white elm, occurs on stream bottoms and on swampy depressions where the land is too wet for agriculture, unless underdrained. Consequently, such stands are the cover that remained after forests were cleared for settlement, because of the difficulty of operating the site on which the elm stood. Elm, however, will also spread into dryer areas and it is a common hedgerow tree.

Ten other forms of forest cover were also found to occupy small acreages during the 1969 survey. These are:

1. Sugar maple-beech-birch
2. Bur oak
3. White oak-black oak-red oak
4. Beech
5. Willow
6. Black ash
7. Red maple
8. Black maple
9. Red oak
10. Ironwood

Red maple locally tends to occupy a remnant position in areas where it may be the survivor of former stands of which it was a component. Black ash is found mainly in the form of young stands in swamps, sometimes pure and sometimes the predominant species with elm and silver maple. Beech stands in pure form are usually the remnants of cut-over sugar maple-beech stands. Black maple in stand form would be considered a rare and interesting incidence. Ironwood is a direct result of stands that have been overgrazed, leaving the unpalatable young ironwood to succeed.

FOREST COVER TYPES BY TOWNSHIPS

(PERCENTAGE BY AREAS SAMPLED)

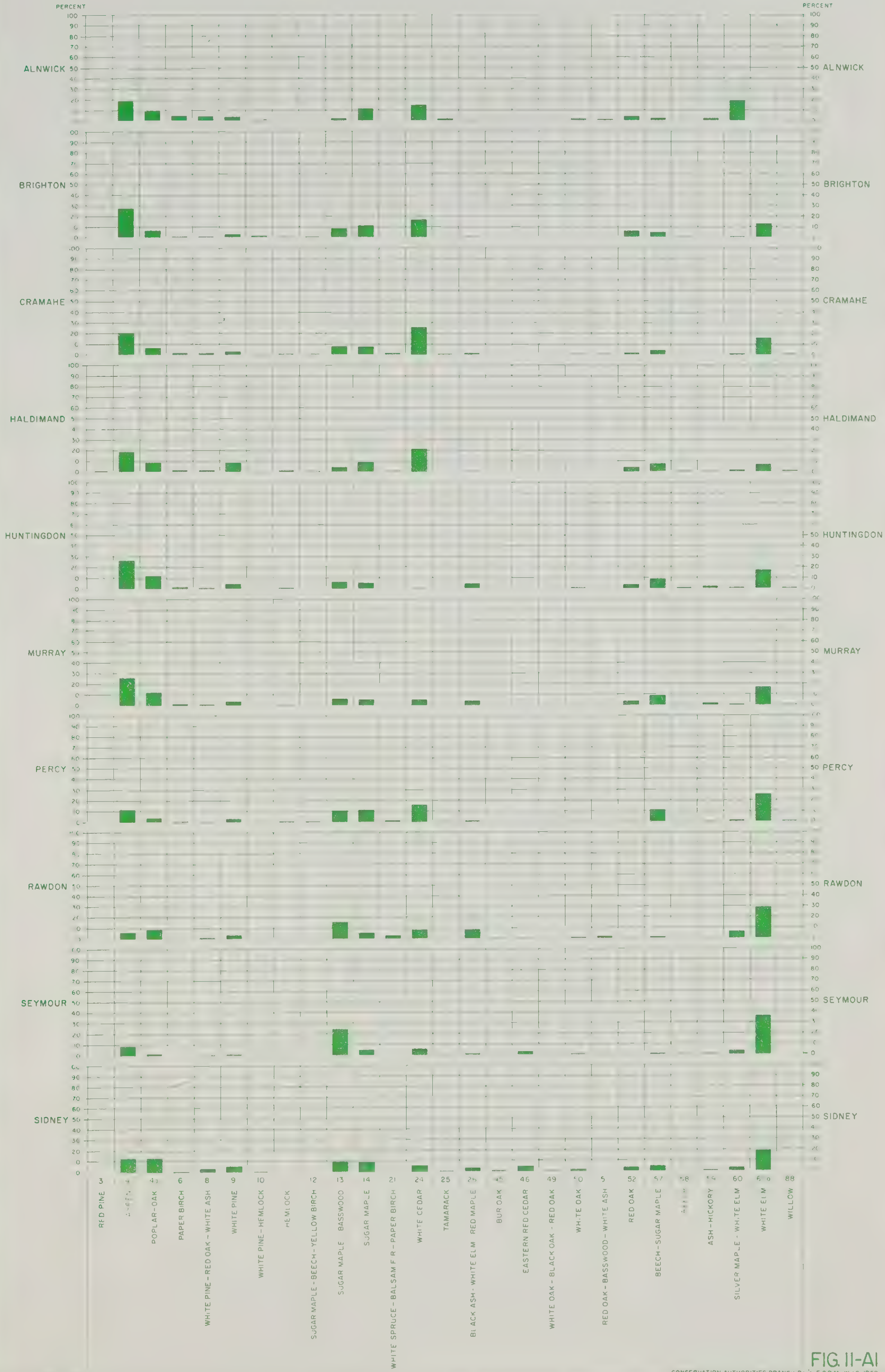


FIG. II-A1

LOWER TRENT REGION

CONSERVATION AUTHORITIES BRANCH Dep't E.& R.M. WJC 1969

WOODLAND CONDITIONS BY TOWNSHIPS

(PERCENTAGE BY AREAS SAMPLED)

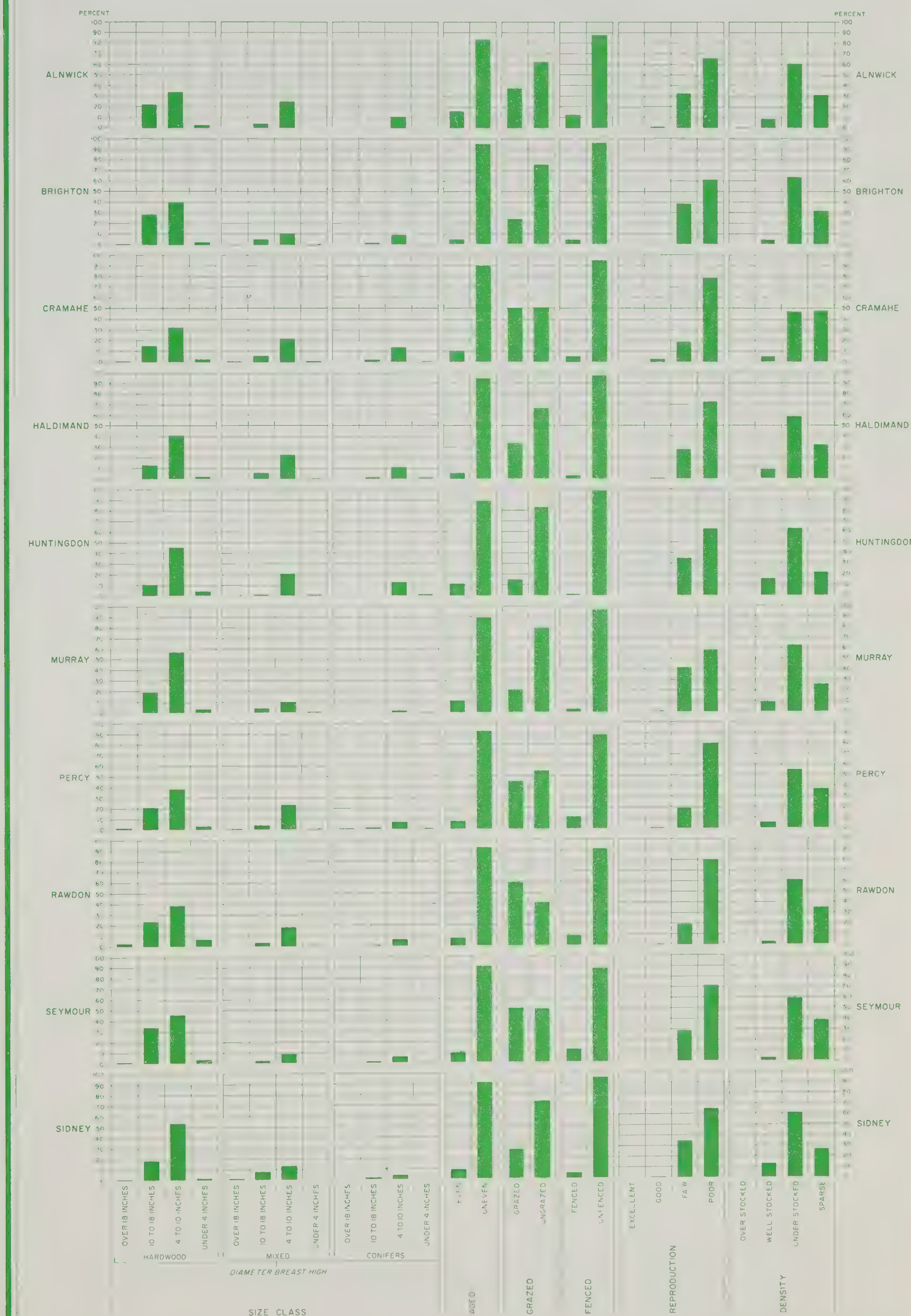


FIG. II-A2

LOWER TRENT REGION

CONSERVATION AUTHORITIES BRANCH Dept. E.&R.M. W.J.C. 1969

Section A12
OUTDOOR RECREATION AND RELATED ACTIVITY

1. The Trent Canal From Trenton to Hastings

During the summer of 1969 an intensive study was made of the recreational potential of the most obvious landscape feature in the Authority, the Trent Canal from Trenton to Hastings.

The aims of this study were to discover the current use made of the canal, the inadequacies or the suitability of the surrounding landscape to support various types of recreation, the effect of cottage development on the canal and the surrounding landscape, and finally, to arrive at an overall future development plan for this portion of the Trent Canal.

The study undertaken on this portion of the canal was concentrated in two areas. The first was a landscape analysis of the canal and the surrounding area, and the second was an intensive study of the cottages along this portion of the Trent River.

The landscape analysis was conducted by using Philip H. Lewis' technique of ascertaining "environmental corridors" in the area. Such a corridor is a linear pattern of major resources having a distinctive quality which differentiates it from the surrounding area. Lewis concluded from a study in the State of Wisconsin that surface water, wetlands and significant topography were the major elements in the midwestern landscape that offered working, living, and recreation qualities. The landscape analysis for the present study followed Lewis' method with a few minor alterations. The major resources mentioned above, as well as vegetation, and additional, man-made, recreational features (campgrounds, marinas, golf clubs, ski areas, etc.), found in the Authority were mapped on transparent overlays and compared. Through the use of the overlay system a linear pattern of corridors became very evident.

These environmental corridors are the basic resource unit for recreational-environmental planning. The inventory and mapping of these corridors encourages planning for total environmental development rather than for ad hoc, haphazard development. Directing development in keeping with natural landscape-oriented environmental corridors offers a number of advantages, including the following:

1. Corridors act as natural foils to unify residential development;
2. they enhance and stabilize property values;
3. they act as natural "air conditioners" (affecting temperature and offering some pollution control), and
4. they protect flood plains from development.

Thus within the context of the study, a particular environmental corridor or planning unit — that one which extends from Trenton to Hastings along the Trent River — became the area for further physical and social analysis to discover its potential for recreation. It was in this manner that the boundaries shown in Figure 12-A1 were ascertained.

Having located the physical boundaries of the "corridor" within the regional context, a detailed ecological analysis and an activities analysis were carried out

to establish some of the more significant natural and cultural features of the waterway that would help the boater gain a greater appreciation of the area's values and attractions.

a. Ecological Analysis:

i. Physiography

The topography of the area, its relief, elevation, patterns of rivers and streams, its landscape identity, its geological features and so on were identified and mapped. This is one of the most effective bases for describing constituent regions within an area in that they are internally homogeneous. For example the Percy Reach area is flat, a great resource of ground water and the major resource of marsh and wetland wildlife, and therefore good for some types of water based recreation as compared with the Campbellford area which is basically drumlinized till plain, vegetated with many upland plant species, good soils and therefore good agricultural land.

The Glen Miller Rock is another significant geological feature that could be an interesting attraction to both boaters and land based recreation seekers.

ii. Soils

The pattern, distribution, physical properties, intrinsic productivity, foundation characteristics, and drainage behaviour of sand, loam clay and marsh or muck soils were identified.

Interpretation of this data revealed a very close relationship to the physiography and vegetation associations, as well as an indication of land capability for certain degrees of development.

iii. Rivers, Lakes, Wetlands

Identification of water related features such as waterfalls, sand beaches, dams, hydro-electric plants, pollution sources, aquatic weeks, and species of fish indicate existing conditions and suggest some potential for water related activities.

iv. Vegetation Associations

Upland and wetland species were identified giving a general indication of the type of ecology of the area. Six zones of vegetation associations were identified and related to physiography, soils, and water levels, so that a greater understanding of the physical framework could be gained of the area.

Ecological Units: By combining information of the four types outlined above (through the overlay map method), general "ecological units" or homogeneous planning areas emerged.

It becomes obvious that the boater is experiencing many different landscapes as he moves through the waterway. These different landscapes are conducive to specialized recreational activities and exhibit various degrees of development capabilities.

b. Activities Analysis:

Analysis of the man-made features and activities in each of the identified units was conducted.

i. Visual Analysis

Within each of the ecological units a detailed analysis of the man-made features was made to gain a general impression of the visual character of each unit.

ii. Existing Recreational Features

Most of the existing recreational facilities (cottages, marinas, public access, etc.) were located on overlays. These indicated the facilities already provided, and again gave each ecological unit a particular character.

iii. ARDA Land Capability for Recreation

Within each ecological unit all the individual land capabilities for recreation identified and mapped by ARDA were grouped to get a general recreation capability. For example, ecological unit A was generally capable for fishing, boating, lodging, and man-made features, which tends to make the area urban in context, while unit B which is generally capable for fishing, boating, upland and wetland wildlife reveals a much less urban character. Thus it ascertained that each unit was capable for different recreational activities.

Recreation Potential: Within each of the ecological planning units an overall recreation potential was assigned to establish goals for development. It became obvious from the ecological and activities analysis that this section of the Trent Waterway does have tremendous recreation potential.

Some comments on future development in specific areas shown on Figure 12-A1 are as follows:

Trenton to Frankford

At the present time this stretch of the waterway is characterized by haphazard, ill-planned urban sprawl between the two towns. The boater travels through five locks. This area could remain as a high intensity residential area extending along the shore between Frankford and Trenton with walkways, open space, public access to water, and boat access to shore, motels and cafes, with much more docking space provided. Simple planning and subdivision controls could prevent the current type of development and make a much more aesthetically pleasing area.

With some initiative both Frankford and Trenton could be "nodes" paying particular attention to downtown redevelopment which could be water oriented.

Frankford to Campbellford

This area should be subjected to low key recreation development. Boaters could be provided with docking facilities to take advantage of hiking trails, scenic overlooks, fishing, canoeing, camping, picnicking and swimming. Cottage development should be restricted or curtailed, and scenic easements might be considered to preserve some of the more visually pleasing reaches of the waterway.

Campbellford

Locks 11 and 12 and the connecting channel show a high potential for docking and day use activities.

Crowe Bay Area

This area should be maintained as a marsh swamp. No cottage development should be allowed in this area.

Lock 16 - 17

This could be a special "node" providing access to hiking trails, swimming and fishing. The historical significance of Healey Falls, and the nomenclature of the islands should be recognized through the use of explanatory plaques.

Healey Falls to Hastings

Cottage development should be restricted in this area in that it is a comparatively fragile ecological unit. Docksites could be established on some of the islands which would also provide sites for overnight camping and picnicking.

During the course of study further work was done along specific areas of the canal, and at specific lock stations. Space does not permit the inclusion of these studies here but this information will be made available to the Authority.

The above method of landscape analysis and planning for development has proven successful in this instance. From the outline of the procedures and conclusions shown above the Authority should work with the other agencies involved in the jurisdiction and operation of the Trent Waterway to help make this a significant landscape feature of regional, national and international importance.

2. Cottages along the Trent Canal in the Lower Trent Region

In addition to the shore of Lake Ontario, and the small inland lakes in the watershed, the Trent River is being rapidly developed with cottages. As this is an important aspect of the overall quality of the environment, and especially of Trent waterway, an intensive study of the cottages along the Trent River was carried out concurrently with the above "corridor" study. The ecological units mentioned above play an important role in the recommendations concerning cottage development which appear later.

For this study a cottage was defined as a permanently constructed, rural, non-farm dwelling, adjacent to water, and its immediate surroundings maintained and utilized for recreational purposes for at least part of the year, and not serving as a permanent place of residence.

An initial reconnaissance revealed that there are no cottages (as defined) south of Frankford on the Trent Canal. The reasons for this are two-fold: the riparian road system of Highway 33 and the Glen Miller Road on the banks of the river, and the relative swampy, or cliffed, inaccessible shorelines. This situation is not likely to change, present land use indicating a continuing trend to strip development of permanent housing along these roads.

North of Percy Reach rapids, Department of Transport property and swampy shorelines inhibit cottage development. The town of Campbellford thus presents a contrast to towns further north along the Trent River, in that there are no significant cottage developments near the area. North to Healey Falls, Nappan Island and on to the village of Trent River the number of cottages increases despite an inhospitable shoreline for cottages. West of the small groups around Trent River the concentration thins out slightly. Both east and west of Hastings significantly large numbers of cottages have been built. Westward to Rice Lake the number of cottages remains high, in spite of the most meagre site suitability.

It was discovered that cottages were developed in groups. These groups and the number of cottages within each are shown on Figure 21-4.

During the course of the study, data was collected on approximately 1,240 existing cottages along the Trent Canal. This data was collected in three ways.

The following details were recorded from observations: type of water front (type of beach, rock, bluff, marsh or swamp, etc.), function (all summer use, weekend use, summer use, winter use, etc.), physical character of site (trees, grass, rock outcrop, etc.), development or condition of the cottage and site, and number of cottages in the cottage group.

Personal interviews were conducted on a sample basis to ascertain owner information, pattern of use, party composition, activities, attitudes, and values both personal and monetary.

Information was also collected from tax rolls, to ascertain land taxes, building taxes, cottage populations and the growth since 1950.

The distance of each cottage group to the nearest urban centre by road and by water, and to the adjacent cottage group were also determined.

In all, 13 variables for each cottage group were determined and a numerical value placed on them.

These data were then subjected to statistical analysis to determine the answers to a number of questions, the most important of which was the demand for cottage lots. Based on distance, populations, land value, site and taxes, a figure was determined for each cottage group and intervening space which indicated a high, moderate, or low demand for cottages in a particular area. Much emphasis was given to the ecological units described above in determining the development zones shown.

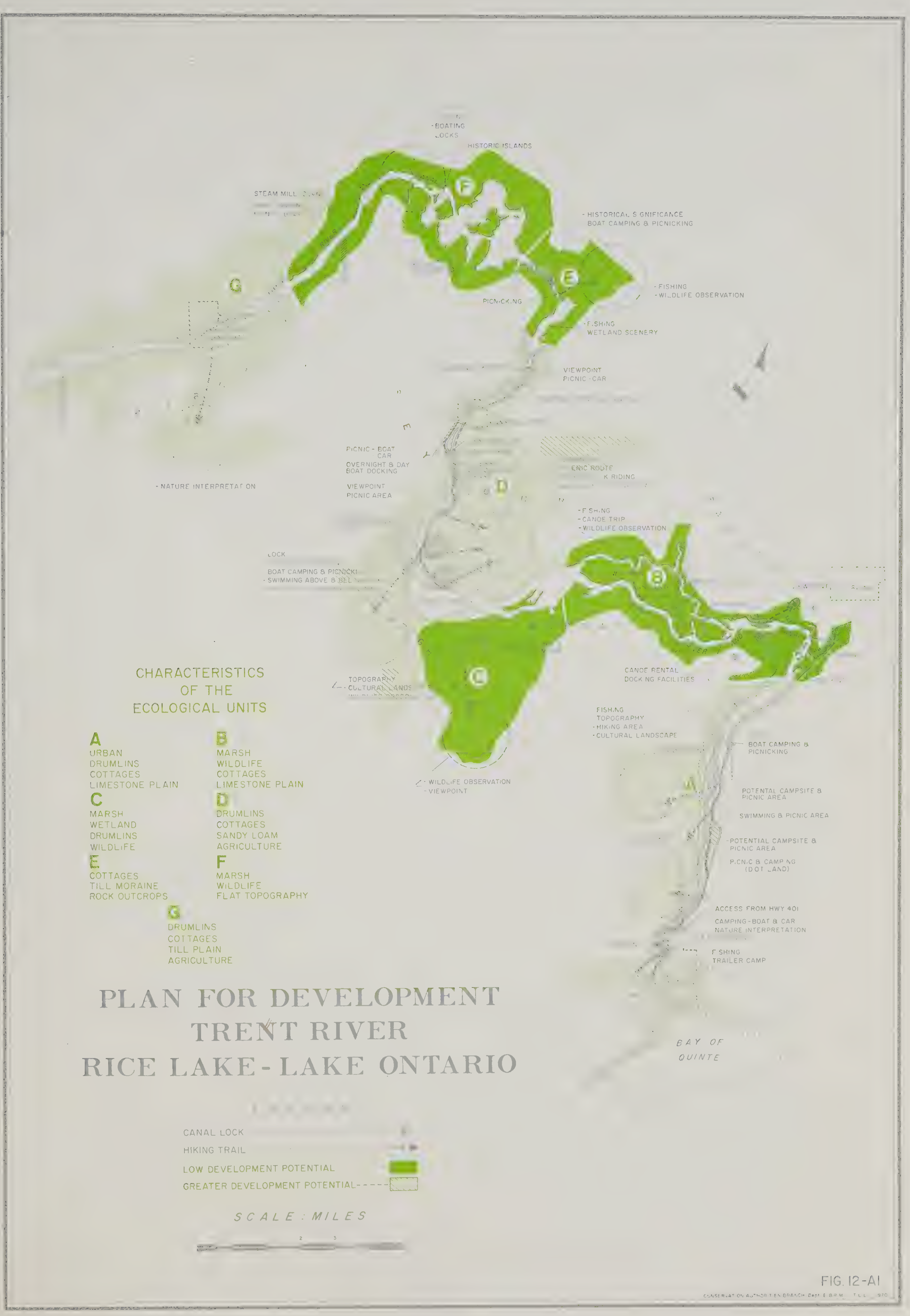
It is recommended that the Authority work with the appropriate government bodies, in bringing about zoning restrictions, and building by-laws that would ensure that the development recommendations of Table A12-1 be adhered to.

The Trent Waterway is a significant resource in the Lower Trent Authority. The above studies were made in order to give the Authority broad guidelines of development in order that this resource might be improved, and become an even more significant high quality attraction for all types of outdoor recreation seekers, at the same time preserving and enhancing the environment through which it passes.

Table A12-1
KEY TO POTENTIAL DEVELOPMENT ZONES

Zone	Ecological Use Capacity (1)	Present Percentage Access to Shoreline (2)	For Provision Of Service (3)	Demand For Cottage Lots (4)	Development Potential
A_1	High	Very Low	High	High	Low development is recommended, access to the water is limited by highways on both banks. Much of the shoreline is cliff and much land is owned by D. O. T. Frequent dams and rapids limit boating.
A_2	High	High	High	Low	Limited development is recommended in "well drained" areas. Swamp and low lying areas should not be developed. Proximity to services is a definite advantage here.
B_1	Moderate	High	Moderate	High	Moderate to high development potential in this area. Few cottages are present, providing a number of good sites yet undeveloped on the eastern and northern shore. Again swampy areas must not be developed.
B_2	Very Low	Low	Low	Low	No development is recommended — owners of existing cottages should be advised as to the fragility of the site.
C	Very Low	Very Low	Very Low	High	Same as above
D_1	High	Moderate	Moderate	Low	Limited development is suggested. The present low level of demand relates to the number of cottage resorts present.
D_2	High	Low	Moderate	High	Limited development is dictated by the large amount of D. O. T. land owned in this area, numerous rapids, dams and poor boating access. Non water oriented cottaging is indicated in most existing developments.
E	Moderate	Moderate	Moderate	Low	Limited development is recommended in the northern section of this area as per D_2. The lower section contains many swampy and shallow shorelines. Eastern banks are suitable for development generally.
F_1	Very Low	Low	Low	High	No development is recommended — owners of existing cottages should be advised as to the fragility of the site.
F_2	Moderate	High	High	Low	High development in this limited area is only possible if a high degree of sewage disposal service is maintained and sites are carefully preserved.
F_3	Moderate	Moderate	Moderate	Low	Limited development is suggested along the southern shore. Many good sites are available, but these must be evaluated carefully. Dense cottage concentrations are discouraged.
G_1	High	High	High	Low	High Development potential exists in the area below Hastings, but water quality will be a problem. Some good sites are undeveloped, but foreshores are very shallow. West of Hastings the area is already highly developed.
G_2	High	High	Low	High	Limiting factors to the development of more cottages along the southern shore of Rice Lake pertain to problems of sewage disposal and the development of the remaining, generally marginal sites.

(1) Determined from "Environmental Corridor" Study.
(2) Percentage of roads (Mileage density) per area.
(3) Determined by use of tax dollars, population, and distance to connecting services.
(4) Determined by use of taxes, populations and distances to nearest urban area, and cottage group.



BOATING
LOCKS
HISTORIC ISLANDS
STEAM MILL
HISTORICAL SIGNIFICANCE
BOAT CAMPING & PICNICKING
FISHING
WILDLIFE OBSERVATION
PICNICKING
FISHING
WETLAND SCENERY
VIEWPOINT
PICNIC-CAR
PICNIC - BOAT
CAR
OVERNIGHT & DAY
BOAT DOCKING
VIEWPOINT
PICNIC AREA
NATURE INTERPRETATION
K RIDING
FISHING
CANOE TRIP
WILDLIFE OBSERVATION
LOCK
BOAT CAMPING & PICNICKI
SWIMMING ABOVE & BEL
TOPOGRAPHY
CULTURAL LANDS
CANOE RENTAL
DOCKING FACILITIES
FISHING
TOPOGRAPHY
HIKING AREA
CULTURAL LANDSCAPE
BOAT CAMPING &
PICNICKING
WILDLIFE OBSERVATION
VIEWPOINT
POTENTAL CAMPSITE &
PICNIC AREA
SWIMMING & PICNIC AREA
POTENTIAL CAMPSITE &
PICNIC AREA
PICNIC & CAMPING
(DOT LAND)
ACCESS FROM HWY 401
CAMPING - BOAT & CAR
NATURE INTERPRETATION
FISHING
TRAILER CAMP
BAY OF
QUINTE
A
B
C
D
E
F
G
CHARACTERISTICS
OF THE
ECOLOGICAL UNITS
A
URBAN
DRUMLINS
COTTAGES
LIMESTONE PLAIN
B
MARSH
WILDLIFE
COTTAGES
LIMESTONE PLAIN
C
MARSH
WETLAND
DRUMLINS
WILDLIFE
D
DRUMLINS
COTTAGES
SANDY LOAM
AGRICULTURE
E
COTTAGES
TILL MORAINE
ROCK OUTCROPS
F
MARSH
WILDLIFE
FLAT TOPOGRAPHY
G
DRUMLINS
COTTAGES
TILL PLAIN
AGRICULTURE
PLAN FOR DEVELOPMENT
TRENT RIVER
RICE LAKE - LAKE ONTARIO
CANAL LOCK
HIKING TRAIL
LOW DEVELOPMENT POTENTIAL
GREATER DEVELOPMENT POTENTIAL
SCALE : MILES

FIG. 12-A1

Section A15
EROSION DAMAGE

Table A15-1

AREAS OF PROMINENT FIELD EROSION LOCATIONS (LOWER TRENT CONSERVATION AUTHORITY)

Location Township	Lot	Concession	Type(s)
Alnwick	Lts. 23 and 12	Con III	Rill
	Lts. 8 and 9	Con I	Sheet
Brighton	Lts. 6, 7, 8, 9, 10	Con IX (W of Hwy. 30)	Sheet
Cramahe	Lts. 24, 25, 26, 27	Con IV and V	Sheet, rill
	Lts. 31, 32, 33	Con V and VI	Sheet
Haldimand	Lts. 3, 4, 5, 6, 7, 8	Con VI	Sheet
Huntingdon	Lts. 1 and 2	Con III	Rill
Murray	Lts. 4 and 9	Con III	Rill
Percy	Lts. 17 and 18	Con XI	Sheet, rill
	Lts. 3 and 4	Con I	Sheet, rill
Rawdon	Lts. 1 and 2	Con II	Sheet
Seymour	Lts. 17 and 18	Con VIII	Sheet, rill
	Lts. 5 and 6	Con IV	Rill
Sidney	Lts. 6 and 7	Con VIII	Sheet

A Specific Erosion Site Comparison

Much has been said about the function of wooded areas in curbing the process of soil erosion and a check on this aspect was made during the survey. Sites were selected on which a small woodlot and an adjacent cultivated field were situated, with similar conditions of slope and soil and the husbandry of both fields and woodlots followed the normal local practices.

In all cases of the sites chosen, the cultivated fields were growing spring grains, some of which were seeded to forage crops. In examining these fields, a 62 per cent incidence of sheet and rill erosion, commonly attributable to unslope cultivation methods, was noted. Evidence of harrowing in this direction also contributed to off-field soil losses.

Again, in all cases, comparative soil losses in the adjacent predominantly sugar maple woodlots, were less and usually negligible. Such soil losses as had occurred were in the form of light sheet erosion, which, with the exception of one site, had moved portions of the litter layer only. Losses were found in woodlots that had been grazed.

The results of this simple study show that where woodlands control a total area of slope, erosion will be controlled. Adjacent land cultivation often requires simple changes to supplement the effect of the woodland.

The Local Function of Trees as Shelter

In the course of clearing and settling new land, it has been a traditional practice to locate homes and farm buildings on heights of land for purposes of drainage, and often to provide a homesite that allows the residents to oversee their lands. As clearing is completed, a condition of exposure to the elements is often reached, which in southern Ontario has been frequently offset by tree planting. The common occurrence of old sugar maples lining roads and lanes is evidence of this. At the present time, the increased emphasis on special crops and newer forms of livestock husbandry, have in turn increased the need for greater attention to various means of reducing exposure problems. Within the Authority, areas of abrupt topography and the location of many farmsteads on obviously exposed sites, indicate a need for attention to be given to establishing windbreaks and shelterbelts as a normal conservation function and practice.

It is suggested that local property owners should plan for primary windbreaks of at least 20 to 25 feet in height along the general field pattern edges. For protection of special crops, intermediate windbreaks should be considered. *

When proper species are used and when windbreaks are correctly placed, the effects are almost entirely beneficial. The effects may be direct or indirect, but in either case are the result of the reduction of wind velocity. The effects of windbreaks on crops and cultivated fields may be listed as follows:

Direct effects

(a) Wind damage and lodging of small grains and corn is reduced or eliminated;

(b) Snow and resultant moisture are more evenly distributed over the fields, particularly on the higher spots where they are most required, and

(c) Wind erosion of the soil is minimized.

Indirect effects

(a) Moisture loss by evaporation is reduced;

(b) Temperatures in the field are raised, which may prevent frost damage, accelerate growth and even lengthen the growing season slightly;

(c) Erosion of the soil by water may be reduced by its more even distribution when released from snow;

(d) Reduction of heat loss to buildings in the winter, and

(e) Improvement of produce and earlier ripening through reduced exposure.

Although windbreaks should be placed mainly to contend with the effect of prevailing winds there are many places where they should be placed on all sides of buildings or special fields.

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* Geiger, Dr. Rudoff *Climate Near the Ground,* Harvard University Press, Cambridge, Massachusetts, 1957, P. 394.

The traditional practices in establishing tree shelter systems have often been based on a presumed exposure to northerly winds. Meteorological reports from weather stations at Trenton and Stirling indicate that considerable variation in wind direction throughout the year creates a need for careful consideration of the desired functions of windbreaks and shelterbelts, before planting the trees out. A degree of wind shaping of trees on the edges of reforestation, and in up to one-quarter of local shelterbelts, as well as instances of grain lodging in 1969, also indicate that conditions of local wind exposure do occur.

Although experience has shown that windbreaks are an asset to any farm or rural property, and that adverse effects, if any, are local and easily remedied, an effort was made during the 1969 survey to gain some insight into the local view of the use and value of windbreaks and shelterbelts. Because tobacco occupies much of the lighter soil in the Authority, interviews were confined to tobacco growers. These interviews were supplemented with field examinations of local windbreaks and shelterbelts throughout the authority.

As expected, not all local tobacco growers agree with the use of tree windbreaks. The more effective windbreaks and tree belts belong to those who do accept their value in crop protection and reduction of erosion. These are located in the Centreton, Carmel, Castleton area.

General crop protection has been the function for from 60 to 90 per cent of regional shelter systems. Although tobacco land protection has proved significant to some property owners, shelter is used more frequently for those crops that are used in normal mixed farming operations. Outside of the tobacco growing region, over half of the local windbreaks and shelterbelts are meant to shelter houses, roads and lanes. Very few farmers have deliberately established shelter for barns.

Elsewhere, in other regions and other countries, planted shelter has been shown to provide positive practical benefits to houses, since the reduction in exposure can mean as much as a 23 per cent reduction in home heating needs. Similar exposure reduction benefits are applicable to buildings used by livestock. Additionally, belts of this type reduce snow problems with yards and feedlots. Benefits have been reported by farmers as including up to $800 per year saved in fodder consumption for an individual farm. This is because animals do not have to consume larger quantities of food to maintain body heat.

Although 17 per cent of the shelter systems visited in 1969 had been pruned, there was a need for specific management measures in over half the belts observed. The most common measure required is pruning and thinning to make some belts more porous. This is important in the older belts, planted to shelter roads and lanes, particularly those that consist of no more than one or two rows of trees. There is also a local tendency to plant such belts too close to buildings and roads, thus tending to reduce the ability to control drifting snow. In some cases younger belts planted too close to lanes and on either side of them, will increase snow accumulation until such time as the belts are tall enough to create a clearing effect as wind passes through the belts near ground level. Pruning and judicious thinning assists this action. Drifting of this nature may cause inconvenience and at times conceivable hardship.

Although board or slat fences are an alternative means of controlling the snow drifting areas, they involve an annual cost of erection, removal and maintenance.

The object of a snow fence is to mechanically reduce wind velocity near the ground to cause a drift to form where it will be least harmful. Reduction in wind velocity creates two pools of relatively calm air, a small one on the windward side and a larger one on the leeward side, and it is here that the drifts form, leaving the area farther to the leeward free of drifting and comparatively free of snow. As winds become stronger, the wind reduction and the width of the calm pool on the leeward side will increase, and the centre will tend to move farther away from the windbreak. A large belt of trees which will accumulate a large drift of snow on the windward side may be planted right to the edge of the road, the windward edge extending back a distance equal to three or four times the height of the trees, and generally at least 100 feet.

In some cases the snow trap type of windbreak is effectively used. It is composed of one or more rows of trees close to the road with a wide opening windward and then a single row of trees. The single row arrests the force of the wind and the snow is deposited in the opening. This has the advantage of requiring fewer trees in the shelterbelt and leaving the ground between open for cultivation in the summer.

The poor placement of windbreaks may accentuate drifting conditions. A single row of trees, unless it is a dense coniferous type, is seldom dense enough to stop winter wind and may create drifts. Prejudice against windbreaks for snow drift protection on roads may arise from such poor or poorly placed windbreaks. If a windbreak has openings, or if it ends abruptly, streamer drifts will form. Windbreaks should be kept dense and tapered at the ends by using progressively smaller species of trees and shrubs to prevent formation of streamer drifts. L-shaped belts are another type that can be used.

Both the height of the trees and the wind velocity influence the effective range of windbreaks. An average windbreak will reduce the ground velocity of a 20 m. p. h. wind ten per cent or more for a distance of about 30 times the height of the trees. About a quarter of this effect will be felt on the windward side of the windbreak, three-quarters on the leeward side. For example, if the trees are 40 feet high, the total effective range with a 20 m. p. h. wind would be 30 times 40, or 1,200 feet — 300 feet of which will be on the windward side, and 900 feet on the leeward side. The wind velocity is reduced by half at a distance of 500 feet.

Although primary windbreaks are necessary for wind protection in exposed areas, intermediate windbreaks are also needed, particularly in areas where high value cash crops are grown. These serve to maintain protective effects close to ground level, at the mid-way point of open fields or beyond this point.

Since root interference with such crops is undesirable, it is often possible to use manageable tree species. Green ash has been used successfully in such cases on the Canadian Prairies. Shrubs, such as caragana, are useful for this function, since they take up less space and can be controlled with standard farm implements. Annual plants such as sunflowers planted as one row in every ten rows, have been used. Recently research in the American Great Plains has shown that three rows of sorghum, planted every 30 feet, produce protection and snow spreading in agricultural crop areas.

Within the Authority there are instances of successful shelter systems utilizing lilac with black locust. These are common in the authority's Lake Ontario section.

Systems of multiple parallel belts are useful. Their placement should be guided by several principles:

1. The greatest distance between belts should be no more than the maximum extent of wind reduction of a wind blowing perpendicular to the first belt;

2. Overlapping of protective zones between belts is an important consideration;

3. The maximum distance between belts will depend on the susceptibility of the soil to erosion and the intensity of its use, (this distance will likely vary from ten times the height of the protective trees or shrubs to 30 times their height) and

4. Shelterbelt placement and design will depend on the amount of heavy prevailing wind, the velocity reduction percentage required and the value of the crop being protected.

It is therefore recommended that the Authority encourage in every way the proper placement, design, establishment and management of windbreaks by private landowners.

The growing trend toward confinement feeding of livestock increases the need for shelterbelts around feedlots, buildings and exercise yards. This technique allows the farmer to concentrate on the production of greater tonnages of feedstuffs in his fields through mechanization and heavier field crop production methods. This material will normally be stored at the farmstead and fed over the winter or brought directly to livestock at the feedlot in growing season. The required shelter will have to be placed far enough from buildings to prevent snow drifting into buildings and around feedbunks and silos. Recommendations based on recent studies suggest that the distance between any structure and the shelterbelt should be about 185 feet.

Recent literature from the British Isles, where shelterbelts in agricultural areas are being stressed, indicates that their value has been proved as to health and efficiency of farm livestock. American and Russian sources also estimate that a withdrawal of five per cent of cultivated ground for shelterbelts results in an increase of output of 20 per cent on the sheltered lands. British farmers apparently are willing to spend considerable sums in planting and caring for the windbreaks in order to achieve the advantages.

It should be kept in mind that under certain circumstances, windbreaks and shelterbelts may cause air stagnation, which may increase temperature and moisture conditions that are dangerous in summer, or increase frost damage in spring and fall on small areas, particularly in hollows. Where this is likely to occur, the shelterbelt should be planted so as to guide the flow of air past such spots. Where these conditions develop after the shelterbelt is established, they may be relieved by the judicious opening of the shelterbelt.

Where farmsteads are located to take advantage of shelter from natural woodlots, certain management measures are needed to maintain this shelter function properly. One of the important features of this management will be control

of the tree stand's density. The results of recent Russian shelterbelt research are of considerable interest. * These studies indicate that the thick forest belts (134 feet wide) through which wind could not pass, provided maximum wind reduction only in the shelterbelts themselves and in their immediate lee, and that maximum wind reduction occurred some distance above the ground. Maximum distance at which ground level effect was felt was about 40 times the average height of the shelterbelt. Dense shelterbelts can also increase evaporation in specific areas due to the increased turbulence they cause. As the shelterbelts were thinned, the point of maximum wind reduction moved farther outward into lee fields, the maximum horizontal effect of the wind reduction lengthened and was felt closer to the ground, coming down to about six feet above ground level.

The amount of thinning had an important bearing on wind effects. Moderate thinning with a shelterbelt about 13 yards wide and allowing moderate wind passage through its trees, gave useful wind protection to a distance of five times the tree height in its lee area, and some protection for a distance of 46 times the tree height. A permeability of 40 per cent has been proved the most desirable. Numerous small holes in the belt are good since they pass warm air, thus increasing the temperature.

Further thinning, to a point where the same width of shelterbelt is easily passable by wind, gave maximum wind reduction from a point six to eight times the average tree height in its lee, to another point at ground level over 50 times the average tree height out from the lee edge of the shelterbelt. However, this severe thinning produced higher wind velocity in the immediate lee of the shelterbelt.

In crop situations shelterbelt requirements are somewhat different. Crops that are normally less than half the height of the belt require medium density belts. If over half the height, the belt density should increase.

The area of the protective zone dwindles when the angle of the incidence of the wind direction to the shelterbelt increases; when the belts of woodland are parallel to the prevailing wind beneficial shelter effects are at a minimum. Studies have, in fact, indicated that in the case of long, narrow fields between such shelterbelts, wind velocities will increase. This will also occur in cases of gaps in shelterbelt systems to the point that the wind velocity in the gaps is greater than it is over open land for distances three to four times the height of the belt. This is called a "nozzle" effect, and it was found on a number of sites in the authority.

Gaps in a forest belt system should be planned so that they do not form long straight corridors. In some cases three to four belts are recommended. It is often considered that the best profile of a shelterbelt is an inverted "V" with the tallest trees to the leeward of the centre. Other studies have indicated that the extent of wind reduction and turbulence is decreased if the lower growth is very permeable within the belt.

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* Nurklik, *Selected Russian Article on Forest Meteorology: Meteorological Translations No. 11.* Canada Department of Transport. World Meteorological Organization. Technical Note No. 59; *Wind Breaks and Shelterbelts,* WMO-147, T. P. 70. Secretariat of the World Meteorological Organization, Geneva, Switzerland.

The use of windbreak and shelterbelt in a largely agricultural area requires that the spacing of different types of trees and methods of management be designed for the existing type of agriculture. The species of tree used must also be adapted to the site. For livestock farming, a useful plan is initial plantings of fast-growing trees, followed by the planting of slow-growing but sturdier varieties in the remaining spaces. It is sometimes found that animals tend to gather in the immediate lee of the shelter, thereby concentrating their manure too much in one spot. Pruning the bottom six to eight feet of the windbreak will force the livestock to scatter over the field, and yet will provide the necessary shelter. *

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* Farm and Country, U.K. 1960.

Table A15-2

TABLE OF LOCAL WINDS

Period 1955-1966

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Percentage Frequency													
N	6	5	5	4	4	4	5	5	6	4	5	6	5
NNE	6	5	5	4	4	4	4	4	5	5	4	5	4
NE	10	7	8	5	4	4	4	5	7	7	6	9	6
ENE	7	8	9	6	3	2	2	3	4	4	6	7	5
E	3	5	6	7	3	2	2	2	3	3	4	4	4
ESE	1	2	3	4	3	2	2	2	2	2	2	1	2
SE	1	1	2	3	3	1	2	2	2	2	3	1	2
SSE	1	2	2	3	3	2	2	2	3	4	3	2	2
S	2	3	1	2	4	3	2	3	4	3	4	3	3
SSW	3	3	4	6	9	11	10	10	8	6	5	4	7
SW	5	6	8	13	20	23	20	17	13	13	10	7	13
WSW	10	8	6	7	10	9	11	10	9	9	10	11	9
W	9	8	6	4	4	4	4	5	4	6	9	8	6
WNW	10	11	10	8	7	7	7	6	6	7	8	8	8
NW	10	9	9	9	6	7	8	6	7	8	7	8	8
NNW	7	7	8	6	5	5	5	6	5	6	5	6	6
Calm	9	10	8	9	8	10	10	12	12	11	10	10	10
Average Wind Speed in Miles Per Hour													
N	10.2	10.1	10.4	9.5	9.6	8.4	7.8	8.1	8.2	9.0	8.9	10.7	9.2
NNE	11.4	10.3	9.4	10.6	10.9	9.4	7.8	8.1	8.5	10.0	9.7	10.0	8.1
NE	10.3	9.2	10.4	9.5	8.4	8.0	8.2	7.6	8.0	8.8	8.4	9.7	8.9
ENE	10.8	10.9	10.8	10.8	9.2	8.2	8.3	8.7	8.6	8.9	9.0	10.6	9.6
E	9.5	9.0	10.8	10.3	8.6	8.1	7.5	8.1	8.0	8.9	8.8	8.4	8.9
ESE	8.0	9.0	10.1	11.7	9.8	8.2	8.4	7.3	8.0	9.2	8.8	7.5	8.9
SE	8.2	10.0	9.2	10.5	9.2	7.5	8.8	7.8	7.9	10.0	10.7	10.5	9.2
SSE	11.6	10.6	10.2	12.7	10.8	8.6	8.9	9.2	10.8	11.7	12.6	12.9	10.9
S	9.9	9.7	8.7	9.8	8.5	7.5	7.9	8.1	9.7	10.2	12.9	10.5	9.5
SSW	12.8	10.4	9.8	11.5	11.2	10.7	10.8	11.0	11.1	11.4	12.3	11.7	11.2
SW	13.7	12.2	12.3	11.5	11.2	10.8	11.2	11.1	11.6	11.3	14.0	12.3	12.0
WSW	16.1	13.4	14.6	13.4	12.7	11.7	11.3	11.4	11.6	13.5	15.3	14.7	13.3
W	16.1	14.8	15.3	12.8	11.7	11.5	10.0	9.9	11.1	11.4	14.3	13.6	12.7
WNW	14.3	16.0	14.8	15.6	14.6	12.7	12.3	11.3	11.9	12.8	14.2	13.6	13.7
NW	13.5	12.6	13.6	13.0	12.0	10.9	10.8	10.0	11.6	11.4	12.5	11.9	12.0
NNW	11.0	11.9	12.4	11.7	10.6	10.4	9.8	9.1	9.6	11.8	11.1	11.3	10.9

Section A 21
NEEDS AND REMEDIAL MEASURES

6. Grassed Waterways

One method of controlling surface water runoff can be achieved by the use of grassed waterways. However, the effectiveness of a grassed waterway is dependent upon proper planning, construction and maintenance.

The location of a grassed waterway should follow the natural drainage path of the field system and the terminating point or outlet of a grassed waterway should be such that it does not create another erosion problem. The outlet may be into a municipal drainage ditch, tributary stream, or creek. The grading of the waterway should be shallow with no abrupt break in the cross-sectional grade between the grassed waterway and the surrounding fields. In constructing a waterway, care must be taken that a berm is not created along the outer edge of the grassed waterway. A remnant ridge, of this sort, would not allow the surface runoff from the fields to reach the drainage path of the waterway, and in effect could create an undesirable watercourse along the outer edge of the intended grassed waterway. In addition to the gradual grading of the sides of the grassed waterway the edges should be irregular. A lengthy straight edge running parallel to a waterway could also create an undesirable ancillary watercourse.

The width of a grassed waterway should be 14 to 16 feet wide in order to accommodate farm implements for maintenance work. In the event that subdrainage is necessary, the drainage tile should be offset from the centre line of the waterway.

In establishing a grassed waterway the seed mixtures below are suggested. These mixtures are used for erosion control on embankments, waterways and gullies.

Work in a mulch of sawdust or wood chips or straw, along with 800 pounds per acre, of 5-20-10 fertilizer before seeding. Apply 300 pounds per acre, of a 10-10-10 fertilizer at time of seeding. Two months after seeding, top-dress with 150 pounds per acre, of a 33-0-0 fertilizer each month until the new seeds are established.

Well-Drained Soil		Poorly-Drained Soil	
Seed	lbs./ac.	Seed	lbs./ac.
Bromegrass	15	Reed Canary-grass	11
Creeping Red Fescue	6	Ky. 31 Fescue	10
Pennlawn Fescue	6	Timothy	5
Timothy	5	Alsike	6
Perennial Ryegrass (Norlea)	3	Perennial Ryegrass (Norlea)	5
White Dutch Clover	5	Ladino	3
Total	40	Total	40

Upon establishment of the sod cover of a grassed waterway, appropriate maintenance measures should be performed annually to maintain a healthy plant population. These measures include clipping of the grass cover several times during the summer period in addition to the application of fertilizer when necessary.

The primary function of grassed waterways is to facilitate the removal of excess surface water runoff from fields, and therefore a waterway should not be used as a roadway during the spring months when working the fields. Ruts created by heavy farm machinery on the moisture-laden soil will alter the shallow cross-sectional grade of the grassed waterway. Furthermore, treading on the waterway in early spring by livestock can also damage the watercourse.

The benefits of grassed waterways, in erosion-prone areas, should be seriously considered by the Authority and their efforts directed toward those areas where intensified cropping will be carried out. A list of possible locations for the establishment of grassed waterways can be found in Section 17 of this report.

10. Fish and Wildlife Developments

a. Fish

With the exception of streams used for put-and-take fishing (where the fish will be caught before the water warms up) no fish should be planted in the sections of the streams coloured red or green on the map "Biological Conditions of Streams" shown in an earlier section of this report. Most of the blue sections of streams on the map already have brook trout in them. However, if they are streams open to public fishing, they may be profitably restocked at intervals during the summer. The sections coloured in red reached temperatures of 75 degrees F. or higher in the summer of 1969, i. e. , they were above the lethal temperature limit for trout. The sections coloured in green are marginal for trout in hot summers.

A trout stream greatly increases the value of a farm. A considerable number of farms having good trout streams are sold on the basis of the trout stream. The trout water within a reasonable distance of urban centres is being rapidly bought up by people from Toronto, Oshawa, Belleville, and other centres of population. This practice is rapidly accelerating. Some solution is urgently needed to provide fishing for the general public who cannot afford to buy farms.

It is therefore recommended that the Authority encourage farmers and other land owners who own trout streams to open them for public fishing at a fixed daily fee. This practice has already been carried out successfully on stretches of the Rocky Saugeen River east of Walkerton, Ontario, and on many other streams in the province.

In addition, it is recommended that the Authority purchase a property in which there is a trout stream and improve the fish habitat with deflectors and other devices, as a demonstration of what can be done particularly directed towards public and high school children. The area would, of course, be open for public fishing.

The stabilization of stream banks will also improve conditions for fish life.

b. Wildlife Areas

The numbers in the text preceding each area mentioned are the numbers on the map "Existing and Recommended Areas of Special Interest for Wildlife Management." (Vol. I, Fig. 21-3.)

FLOOD PLAIN

BUTLER CREEK AT BRIGHTON

SCALE 500 250 0 500 1000 FEET
(APPROXIMATE)

CONSERVATION AUTHORITIES BRANCH, DEP'T. E.&R.M., L.R.L.-1970

FIG. 21-A1

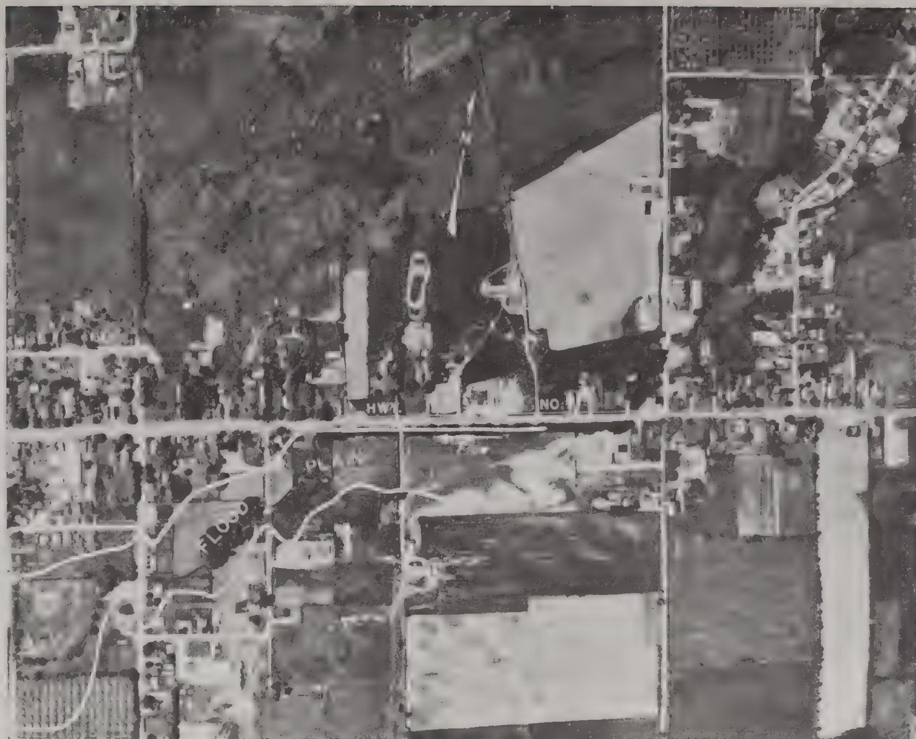
FLOOD PLAIN

BUTLER CREEK AT BRIGHTON

SCALE 500 250 0 500 1000 FEET
(APPROXIMATE)

CONSERVATION AUTHORITIES BRANCH, DEP'T. E.&R.M., L.R.L.-1970

FIG. 21-A1



EAST PANEL

WEST PANEL

FLOOD PLAIN

COLBORNE CREEK AT COLBORNE

SCALE 500 250 0 500 1000 FEET
(APPROXIMATE)

CONSERVATION AUTHORITIES BRANCH, DEP'T E & R.M., L.R.L. - 1970

FIG. 21-A2

WEST PANEL

FLOOD PLAIN

COLBORNE CREEK AT COLBORNE

SCALE 500 250 0 500 1000 FEET
(APPROXIMATE)

CONSERVATION AUTHORITIES BRANCH, DEP'T. E.&R.M., L.R.L. - 1970

FIG. 21-A2

FLOOD PLAIN
AT
HASTINGS

SCALE 500 250 0 500 1000 FEET
(APPROXIMATE)

CONSERVATION AUTHORITIES BRANCH, DEP'T. E.& R.M., L.R.L.-1970

FIG. 21-A3

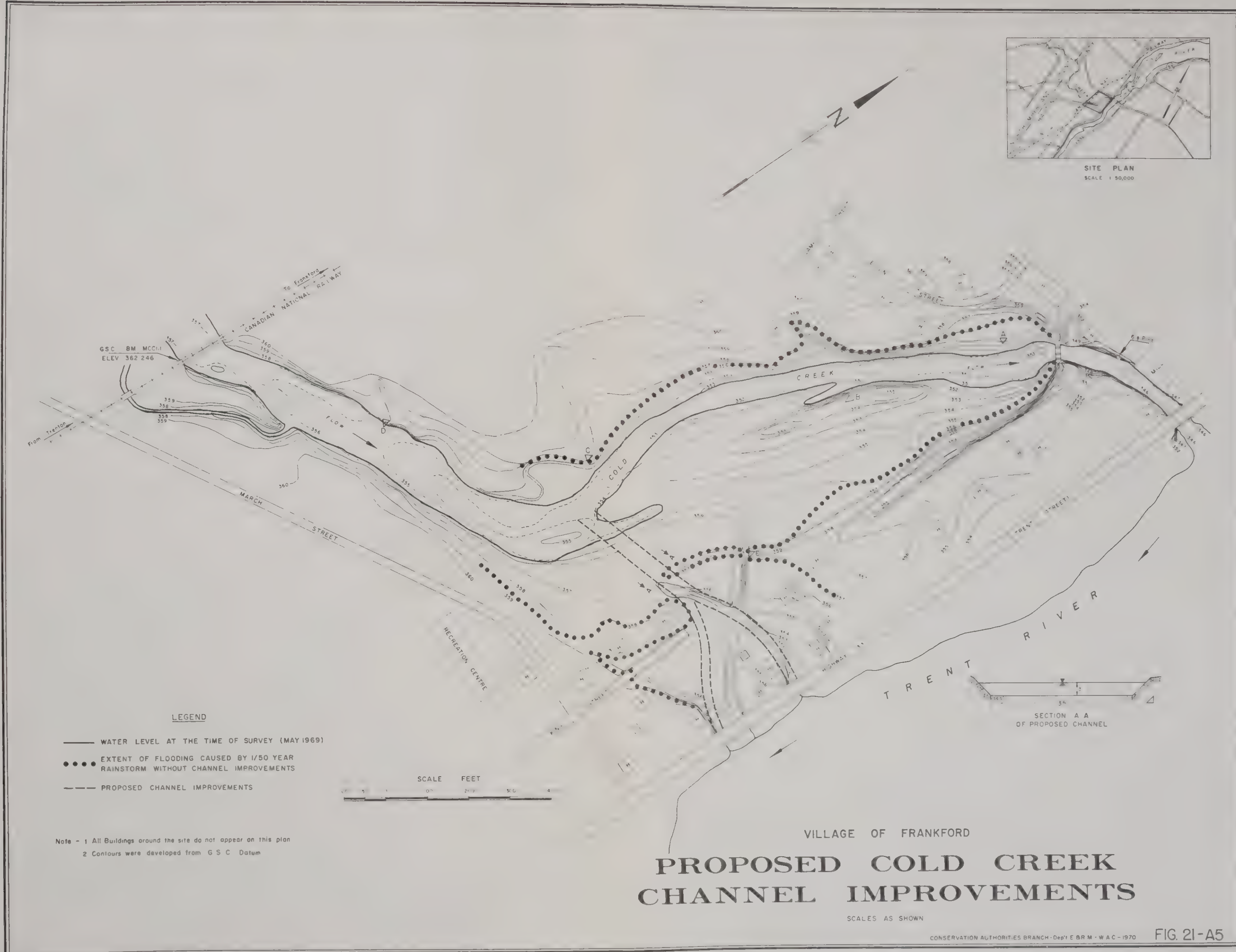
FLOOD PLAIN

MAYHEW CREEK AT TRENTON

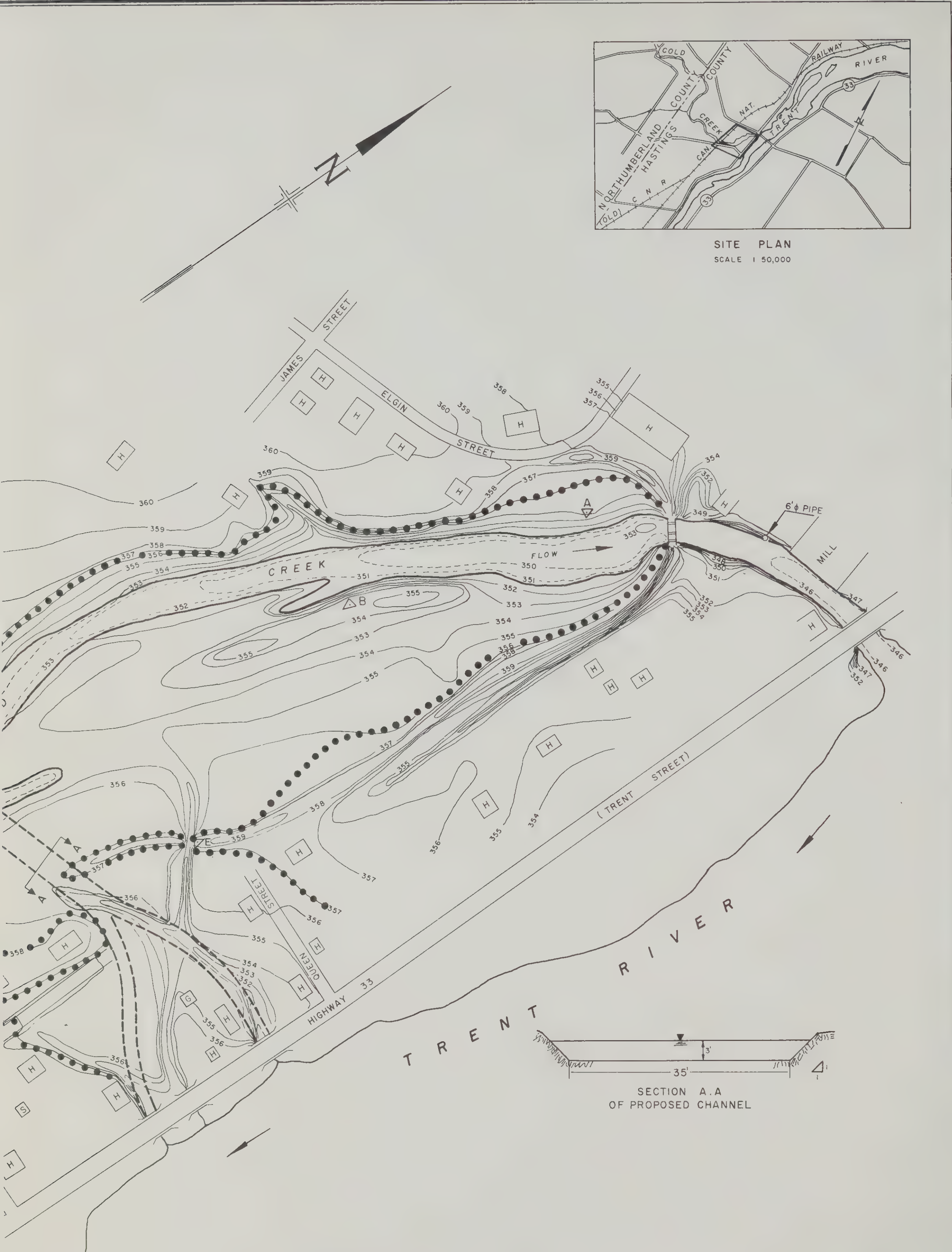
SCALE 500 250 0 500 1000 FEET
(APPROXIMATE)

FIG. 21-A4

CONSERVATION AUTHORITIES BRANCH, DEP'T. E.&R.M., L.R.L.-1970



N
SITE PLAN
SCALE 1:50,000
To Frankford
CANADIAN NATIONAL RAILWAY
From Trenton
G.S.C. BM MCCtl
ELEV 362.246
FLOW
COLD CREEK
MARCH STREET
RECREATION CENTRE
TRENT STREET
TRENT RIVER
HIGHWAY
SECTION A-A
OF PROPOSED CHANNEL
LEGEND
WATER LEVEL AT THE TIME OF SURVEY (MAY 1969)
EXTENT OF FLOODING CAUSED BY 1/50 YEAR RAINSTORM WITHOUT CHANNEL IMPROVEMENTS
PROPOSED CHANNEL IMPROVEMENTS
SCALE FEET
Note - 1 All Buildings around the site do not appear on this plan
2 Contours were developed from G.S.C. Datum
VILLAGE OF FRANKFORD
PROPOSED COLD CREEK CHANNEL IMPROVEMENTS
SCALES AS SHOWN
CONSERVATION AUTHORITIES BRANCH - Dep't E.B.R.M. - W.A.C. - 1970
FIG. 21-A5



VILLAGE OF FRANKFORD

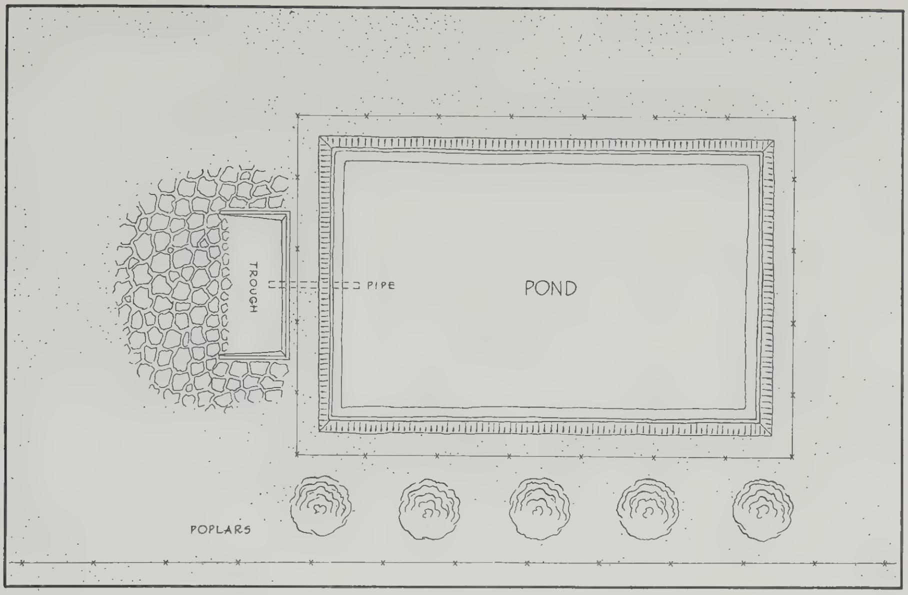
PROPOSED COLD CREEK CHANNEL IMPROVEMENTS

SCALES AS SHOWN

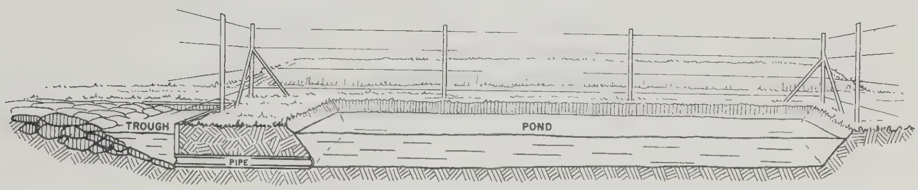
CONSERVATION AUTHORITIES BRANCH - Dep't. E.&R.M. - W.A.C. - 1970.

FIG. 21-A5

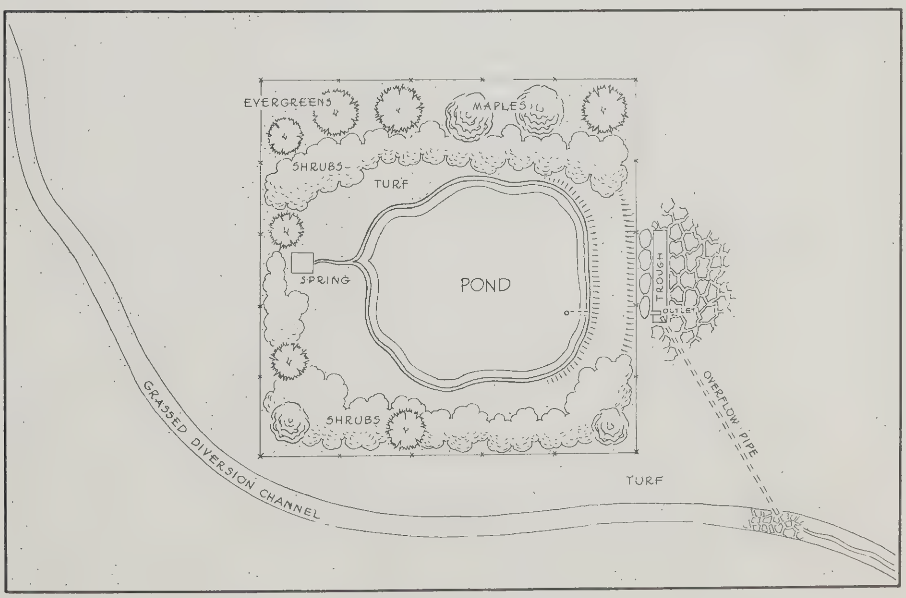
TYPICAL PONDS



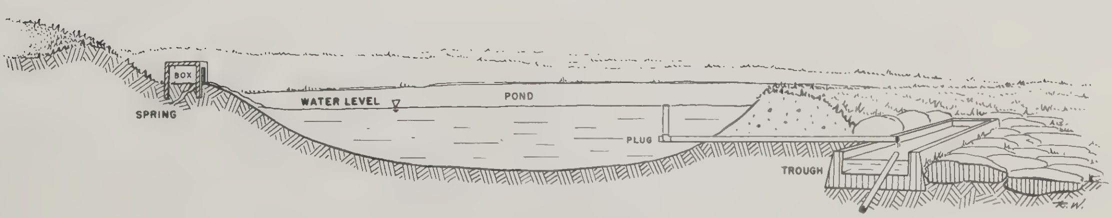
PLAN OF DUG-OUT POND



SECTION OF DUG-OUT POND



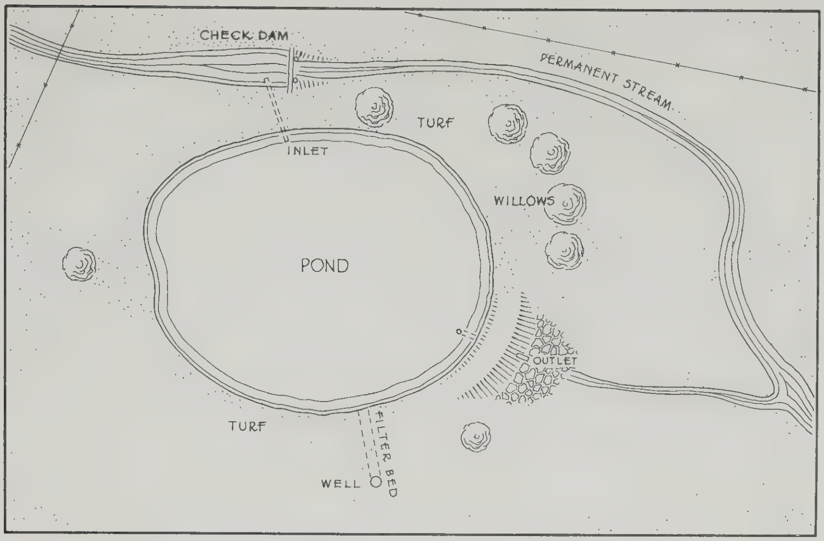
PLAN OF SPRING-FED POND



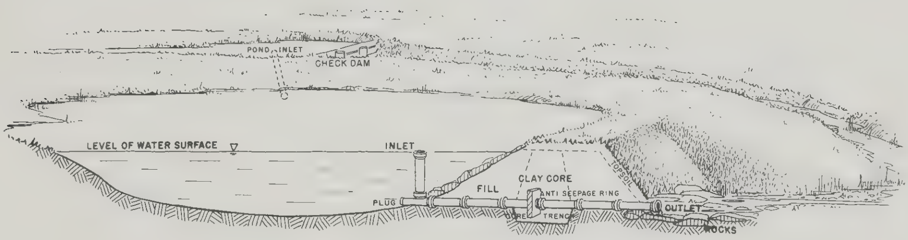
SECTION OF SPRING-FED POND

FIG.21-A6

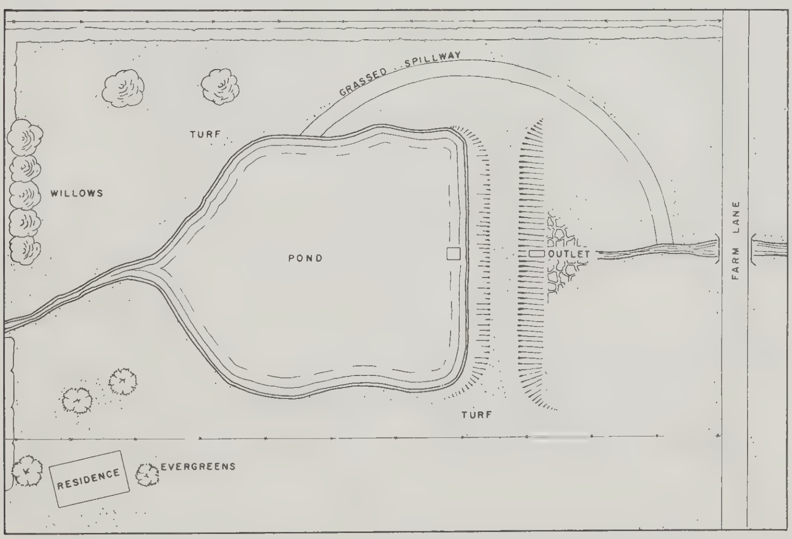
TYPICAL PONDS



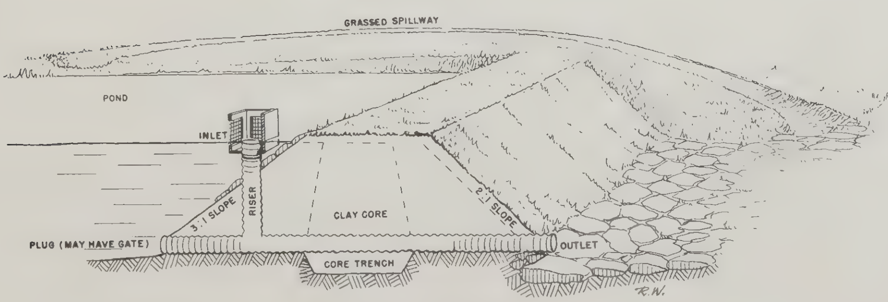
PLAN OF BY-PASS POND



SECTION OF BY-PASS POND



PLAN OF RUN-OFF POND



SECTION OF RUN-OFF POND

FIG.21-A7

1. Moreland Lake Forest and Wildlife Area (Fig. 21-A8)

This is an area including Lots 12 to 14, Concession VII and those parts of Lots 12 to 14, Concession VIII, which lie south of the Canadian Pacific railway line, in Huntingdon township.

About 90 per cent of the area is already in forest cover. The remainder of the area includes poor pasture, scrub cover, Moreland Lake and the pond to the east of it. There are also (in Concession VIII) a few acres of pond formed by a beaver dam. This second pond is shallow and overgrown, and provides poor cover at present. A section where blasting of potholes would improve the area for wildlife is shown on the accompanying detailed plan. Most of the whole area provides excellent deer cover and food, including maple, ash, cedar and a little hemlock, as well as much undergrowth.

There is a dense hedgerow on the abandoned farm which includes much sumac, apple and dogwoods. Blasting is not recommended in the marsh north of the northern pond, as there are too many dense willows present.

An old power line crosses the area near the boundary between Concessions VII and VIII. There is a small cabin near Moreland Lake, reached by a very poor lane which is connected to a road to Fuller.

Since the area is almost entirely under forest cover now, and since the objective of Forest and Wildlife Areas is that they be oriented jointly towards forestry and wildlife purposes, it is recommended that the open areas be gradually planted with shrubs useful to wildlife. The Department of Lands and Forests already has been growing large quantities of autumn olive, (elaeagnus sp. Cardinal variety), along with other species for wildlife use. That Department may also have smaller quantities of the following species available:

Highbush cranberry	*(Viburnum trilobum)*
Red Osier dogwood	*(Cornus stolonifera)*
Mountain ash	*(Sorbus americana)*
Multiflora rose	*(Rosa multiflora)*

It is recommended that the Authority a) make application to the Department of Lands and Forests for a supply of these plants, and b) start a small nursery of its own for these species.

The Authority should also take measures to eradicate, by spraying or other means, any stands of prickly ash, *(Xanthoxylm americanum)* which may occur in this area or other Forest and Wildlife Areas. An additional shrub which should be cultivated is *Rosa rugosa* which is much hardier than *Rosa multiflora.* This makes excellent food for Grouse.

This is a comparatively isolated area but should prove excellent for hunting in the fall.

2. White Lake Forest and Wildlife Area (Fig. 21-A8)

This area in Huntington township stretches from Crookston at the south end to the northern end of Concession XI. It includes Snake Lake as well as White Lake. The marsh south-east of White Lake is an area suitable for blasting to improve wildfowl habitat. Pondweeds and Duckweed could be introduced into new water areas created by blasting. Ducks were already present in the marsh when the area was examined.

The same remarks which referred to the open parts in the Moreland Lake Forest and Wildlife Area also apply to this and other recommended Forest and Wildlife Areas. Sumac (an important wildlife food) should be encouraged wherever it occurs.

It is recommended that snowmobiles be prohibited from the White Lake and Moreland Lake Forest and Wildlife areas, since snowmobiles frighten deer and other wildlife, and an adequate area in Rawdon township is recommended in this report for such recreational activity. In any case, it is expected that the harassing of wildlife with snowmobiles will be prohibited by legislation.

3. Rawdon Township Forest and Wildlife Area (Fig. 21-A9)

A large flooded section had already more than 60 Black Ducks, Mallards and Teal on it when examined on August 18, 1969. Since the pond was in mature condition, having Sago Pondweed, Chara, *Lemna* and *Scirpus* on it when examined, no improvement is needed at present, but the flooded section should be drained for a year when it becomes over-mature. There are many dead elms and other dead trees at the east end of the flooded section. There is also excellent food and cover for upland game birds and cottontails in the area.

The land area is of little value for farming and should not be expensive to purchase. Almost all of it is now in woodland, including on the west side a mixed deciduous and coniferous forest interspersed with small clearings in which sumac is common. The undergrowth was in good condition for deer in 1969.

4. Cramahe Hill Forest and Wildlife Area (Fig. 21-A10)

This area is chiefly woodlot and swamp, with a wide variety of tree species. Cold Creek, which winds through the area, is an excellent trout stream in this section, with ample cover for brook trout and many log jams and dead elms. The area is excellent for Ruffed Grouse, deer and cottontails.

There is a considerable area of very poor pasture in sandy land at the north end. There are a number of very small areas of blowsand in this section. If possible the number of hunters in this area should be controlled.

In addition to the recommended improvements for flood control at Frankford, it is possible to construct a dam about 30 feet high in the wide wooded plain through which Cold Creek meanders. The effect of the reservoir on the present habitat for brook trout and the water downstream from the dam should be carefully examined before any construction is undertaken.

5. Orland Forest and Wildlife Area

This includes that part of Lots 33-34-35-36 which lies south of Cold Creek, in Concession V (east of Highway 30), in Brighton township. This is in general a low-lying area, with potholes and woodlands close to the creek. The potholes could no doubt be improved for waterfowl by blasting.

6. Seymour Township Pothole and Marsh Area

This area includes the whole of Lot 1, Concession VIII Seymour township. This is an area of poor land, including at present a very large section of wet land, with a large pond held back by a beaver dam. In 1969 this was an excellent area

for wildfowl, and many ducks and shore birds used it. The beaver dam might be replaced with a more permanent dam.

7. Murray Canal Wildlife Area (Fig. 21-A11)

There are two areas of excellent marsh for wildfowl on the north and south sides of the Murray Canal. These lie close to a proposed recreation area. These areas are very easily accessible. These both have excellent duck food concentrations already, with considerable quantities of Wild Rice, Narrow-leaved Potamogeton and Eelgrass. The southern area, south of the Murray Canal, is already leased out to hunters. In the north area the Wild Rice tends to be removed by Grackles before the end of summer. It is recommended that the northern area be acquired and that more Eelgrass *(Vallisneria)* should be planted there.

In the southern area the large expanse of Cattails should provide excellent sites for potholes and the blasted potholes would soon fill with water. Additional wildfowl foods could be planted in the potholes.

There should be no trouble in attracting ducks to this area because Blue-winged Teal are already established in large numbers. Some sixty-five Blue-winged Teal were seen in the north and south areas on August 21, 1969. There were also quite a few Mallards in this area.

The area south of the Murray Canal was posted "No Trespassing" for opening day of the hunting season in 1969.

8. Trent River Wildlife Refuge

There are so many excellent wildfowl areas along the Trent River that it seems reasonable to have a wildlife refuge which would probably prolong the season for wildfowl hunting in this area. The area recommended for a refuge is part of Lots 25 and 26 in Concessions I and II of Seymour township. This is at the mouth of Squire Creek. The area is already in excellent condition for a refuge. The area is immediately south of Hoards Station. A wire barrier could be stretched across the mouth of Squire Creek, and the area to the north extending for about the equivalent of one lot on each side of the creek would include the refuge. Various signs would have to be erected.

9. Brown Corners Refuge

This is a small pond south of the village of Castleton and east of Highway 25, immediately alongside the road.

This is an area that is extremely attractive to wildfowl. There is a house nearby and a dam on the pond. This area lies along a scenic route proposed in the recreation section. More than sixty wildfowl were observed on this pond on many occasions, and it obviously has a very attractive food supply. It should remain in private hands and no shooting be allowed on it. It is, of course, illegal to shoot or discharge a firearm from a highway.

10. Percy Township Pothole Area

This is an area of Lots 3 and 4 of Concession III of Percy township. It is low-lying with potholes which could be improved by blasting. On the east and south sides there are township roads.

11. Dartford Pond Wildlife and Recreation Area (Fig. 21-A12)

This is an irregular area comprising parts of Lots 11 and 12 in Concessions V and VI in Percy township. The Dartford Pond is held back by a dam used by both a sawmill and a grist mill. The mill pond is rather thick with algae at present, probably due to pollution either from cattle watering in streams or from barnyard effluents which are found on the upper reaches of Percy Creek.

At the present time, because of the growth of algae, the pond does not appear to be a very good wildlife area, but there is good cover in the upper reaches of the pond. This pond is said to have trout in it, and these are reported to be present only in the spring. There is a good cold tributary which enters the pond from the west, and provides cover and suitable conditions for trout during the summer. There is some potential for creating public fishing in this area, particularly if part of it is developed as a recreation site.

The boundary of the area at the south end would, of course, be north of the lots which have houses on them along the road west of the lower section of the pond. When the present polluted condition of the pond is cleared up by good public relations with the farmers owning the land on Percy Creek above the pond, the upper reaches of the pond should provide very good wildlife areas.

12. Codrington Hunting and Fishing Area (Fig. 21-A13)

This area includes Lots 4, 5, and 6 of Concession X and part of Lot 6 in Concession IX west of Highway 30 in Brighton township. The area is about half a mile north-west of Codrington. This is an area of mixed woodland and scrubland with scattered poor pasture. There is fishing available in a small creek, which is a tributary of Salt Creek. The banks of the stream are severely eroded at one spot, and this condition should be corrected. The stream is cold in this area. There were many brook trout in the stream. In a single pool there were 13 trout at least eight inches long. There is very good cover for trout with logs and deep pools under the banks of the creek. The water comes from springs in the sides of hills, which are within the proposed area. A part of this stream is posted with "No Trespassing" signs and this situation would have to be improved before public fishing could be started.

13. Stevenson Lake Wildlife and Recreation Area (Fig. 21-A12)

This area lies in Lot 18, Concession IX of Perch township. The lake can be seen from the scenic route to the east of it. There are woodlots surrounding the lake on both sides. On the east the cover includes cedar, dogwood, alder, birch, elm, hawthorn, and wild grape. On the west there is a deciduous woodlot with comparatively little undergrowth. No Ruffed Grouse were seen, but a considerable amount of the Hawthorn fruit had been eaten by birds. There was little aquatic vegetation, as the edges of the lake are deep and the area is open. Some of the cedar close to the shore is now dead. The whole area appears very attractive to wildlife, with excellent Grouse and rabbit cover. If the area comes up for sale it should certainly be acquired.

The next eight areas are all marshes, some of which are caused by beaver dams. In most cases their water is not disturbing agricultural lands.

14. Lamey Lake (Fig. 21-A14)

This is an area in Percy township of which the northern section is being subdivided for summer cottage lots. This should not interfere much with the use of the area for hunting waterfowl, as the best area for waterfowl is a marsh south of the lake, and cottages are little used in the fall.

The adjacent marsh is a mature one. The lake has a mud bottom and is covered with vegetation around the edges, *Chara* and Bladderwort being the commonest species. There is a band of floating vegetation around the edges, the chief species being alder, Labrador Tea, and spruce. Cedar, elm and maple lie beyond on drier land. The lake has an area of 42 acres and the marsh downstream covers 22 acres. The marsh is separated from the lake by a loosely packed floating mat of alder and Cattail. Behind this is an area about three feet deep covered with Duckweed and also densely vegetated with Sago Pondweed. Dead trees, still standing, almost fill the marsh. There are many holes in these trees. Wood Ducks and Teal were flushed here.

Downstream from the marsh there is an old beaver dam holding back the water. There was no recent sign of beaver. There is an older dam at a narrow site a little farther downstream. This would be an excellent site for a control weir.

The acquisition of the marsh and construction of a control weir would improve the area for wildfowl and incidentally help to dilute the seepage from septic tanks in the subdivision.

15. Killoran Lake (Fig. 21-A14)

This lake lies in Lots 13 and 14, Concessions X and XI of Percy township.

Here there are 28 acres of water and 60 acres of marsh. The lake is permanent but the level of water in the march is controlled by a beaver dam north-west of the lake. There is a large area of Cattails in the marsh. If the beaver dam is replaced by a rock dam with a permanent weir and holes are blasted in the Cattails, this would be an excellent wildfowl area.

16. Marsh in Cramahe Township (Fig. 21-A15)

This is a small marsh area of about ten acres in Lots 19 and 20, Concession III of Cramahe township. The marsh is surrounded by deciduous forest cover of ash, soft maple, poplar, oak and choke cherry. The vegetation in the water consists of Sago Pondweed and other pondweeds, sedges and Cattail. The vegetation is dense enough to provide adequate food for wildfowl. There is a possible dam-site using the road bed and culvert at the location shown on the detailed map.

17. Pond North-west of Colborne close to Highway 401 (Fig. 21-A15)

This area includes parts of Lots 34 and 35, Concession III, Cramahe township, and Lot 1, Concession I, Haldimand township.

This pond, extending over 10 to 12 acres in 1969, is held back by an old beaver dam which is heavily overgrown, with little seepage. Part of the pond is open and other parts have flooded Willows with pondweeds, sedges and Arrowhead.

Much of the pond is thickly covered with Duckweed *(Lemna)*. There is a smell of fertilizer from the water, possibly due to the feedlot at the farm one mile to the north. Mallards and Teal were common on the pond.

The wildlife cover around the pond is extensive with a large variety of trees and shrubs. It appeared to provide excellent food and cover for Ruffed Grouse, Pheasants and rabbits. There are dense hedgerows along the old road allowance, (a township boundary) which crosses the pond. There is an esker with poor pasture between the pond and Highway 401. Cattle are causing deterioration of the undergrowth in the woodlands. However, one field east of the pond has tall Brome grass which has been left for several years. The tall grasses are six feet high and would be ideal cover for Pheasants. The pond cannot be seen from Highway 401 and there is no disturbing influence.

This is a very suitable location for a Public Hunting Area. Two farms to the north are for sale. There is a narrow constriction below the pond, crossed by a temporary bridge giving access to a field of corn to the south.

A permanent earth dam could be placed close to the present bridge, with an emergency grassed spillway lower than the dam. However, as the pond is mature, it might be advantageous to drain the pond for part of one summer to rejuvenate it.

18. Burnley Marsh (Fig. 21-A15)

This area is part of Lots 5 and 6, Concession VIII, Haldimand township. The area is located just south of Burnley. There is a large marsh, now dry. There was formerly a beaver dam flooding this marsh, but local land-owners appear to have blown out the main dam. Three small dams have recently been built by beaver upstream from the marsh. Many fresh signs of beaver work were seen.

A dam could be placed just north of the largest beaver dam, in such a way that an emergency spillway would be wide enough so that the grazed pasture outside the treed belt is not affected either in spring or in flash floods. The marsh is probably not of much use to beaver now. Grazing of the woodlots should be stopped.

19. Marsh East of Biddy (Little) Lake (Fig. 21-A16)

This marsh includes part of Lot 11, Concession III, Cramahe township, and parts of Lots 9 and 10, Concession III, Brighton township.

This marsh has a very dense area of alder and dead tamarack at its south end. There are holes up to four feet deep in some sections, but the average depth of water is two feet. *Scirpus* is the primary aquatic vegetation in the open sections. There is also much marsh hay (chiefly *Calamagrostis canadensis*). *Elodea* (Waterweed) is common in the water. Around the water there is a general zonation from alder, to dead tamarack, living tamarack, cedar and finally dry deciduous woods as the land rises away from the marsh.

To make this marsh more attractive to wildfowl, additional wildfowl food plants should be planted. These would certainly include Sago Pondweed. There are also areas where the blasting of potholes is recommended, and these should also have wildfowl foods introduced. It should however be noted that blasting can disturb the impervious layer of soil on which the water now rests.

20. Petherwick Marsh (Fig. 21-A17)

This area is in Lot 19, Concessions VII and VIII of Seymour township. There is already a marsh entirely surrounded by woodlands in the area. The water area in 1969 extended over about 20 acres, and was held back by a low beaver dam. The water in 1969 was less than two feet deep. This is an area that could be greatly improved for wildfowl by a dam about one foot higher than the present beaver dam. However, it would have to be determined whether any damage might result to the east-west road which crosses the marsh between Concessions VII and VIII.

Although wildfowl (Teal) were using the marsh in the summer of 1969, the area could be much improved by the introduction of additional wildfowl food plants, such as Sago Pondweed and Duckweed.

21. Marsh in Concession IX of Rawdon Township (Fig. 21-A17)

This is a large marsh extending over about 100 acres, and lying in Lots 1 and 2 of Concession IX of Rawdon township. In 1969 a beaver dam about ten feet wide and less than two feet high was holding back most of the water in this marsh. To keep the marsh permanent, a dam could be built with an emergency spillway, keeping the water at the normal summer level. The dam would stretch from the railroad embankment southwards to a small hill. The dam would be about 20 feet long, and about two feet high.

If a higher dam were built, it is likely that there would be percolation through the railroad embankment. It should also be noted that when this marsh was observed in 1969 rainfall had been slightly above normal. The drainage basin is a small one.

The marsh has already many dead elms in it, and much Duckweed *(Lemna)*. It is recommended that Sago Pondweed be introduced. The surrounding topography is mainly drumlins and eskers, but includes one large field of sedges and very poor pasture in which potholes could be blasted easily. Ducks (Mallards) were in the marsh when it was examined in August 1969.

22. Breakaway Creek Area (Fig. 21-A18)

This area, including Lots 33 to 36 in Concession IV and parts of Lots 34 to 36, Concession III, (east of Highway 30) of Brighton township has much wooded land but also includes some good land cultivated chiefly for sweet corn. By an arrangement with the local farmers it might be possible either to acquire part of it or to add it to the nearby Brighton Public Hunting Area. Many of the unimproved pastures are now growing up in sumac and dogwood, both of which are useful to wildlife. There were areas in 1969 which were supporting grasses three feet tall. There are at least three farms for sale in this area. The area is very suitable for the introduction of pheasants on an annual basis.

Breakaway Creek is cold and could provide good public fishing.

No detailed map of the area is included in this report but a map showing the forest cover and the present crops is available to the Authority.

23 & 24. Depth Contour Maps (Fig. 21-A19)

Depth contour maps are provided of Biddy Lake and Oak Lake (Areas 23 and 24 on the accompanying map). Both lakes warrant further examination to determine if they are suitable for fish stocking.

c. *Murray Marsh Wildlife and Recreation Area*

There is already a very detailed plan for the acquisition and development (for wildlife and recreation) of the Murray Marsh, south of Percy Reach. This plan, prepared by staff of the Department of Lands and Forests at Lindsay in 1966, involves two major dikes and a large amount of ditching and blasting of potholes. The general effect would be the raising of the water level in the marsh and the regulation of the water levels. The plan envisages the management of the area for wildlife, upland game hunting and fur trapping, the setting apart of an area for a wildfowl refuge, and also recreation facilities. It is recommended that the Authority take care to avoid competing with the Department of Lands and Forests for land in the area shown on the accompanying map, but that the Authority draw to the attention of the Department of Lands and Forests any lands that may come up for sale within the outlined area.

11. Recreational Development

Classification of Recreational Lands

As a step toward regional planning, and to assist the Authority considering recreational development in its broadest perspective, a classification of conservation recreational lands should be established. The following is a "use zone" categorization which can apply to either a conservation area in total or to subzones within an area.

The main classes are as follows:

Class I: Natural Areas — These areas would have minimum development and could include: (a) wilderness zones, (b) valley flood lands, (c) biotic or geomorphic preserves, (d) natural streams. The permitted uses in natural areas would be: (1) hiking trails, (2) scenic lookouts, (3) canoe routes, (4) white-water canoeing areas, (5) bridle paths, (6) bivouac-type campsites, (7) nature study, and (8) cross-country skiing.

Depending upon the size of the area and whether it was an entire conservation area or a sub-zone within a larger conservation area, there would be a somewhat different approach to such things as interpretative techniques.

A natural area could assume a corridor pattern, especially where it contained a hiking or canoe route, and could also contain some land under only partial or easement control by the Authority.

Class II: Multiple-use Areas — This category would conform more closely to the concept of the conservation area accepted to date. A multiple-use area could very well include several sub-use zones and hence could permit in sub-zones all of the uses permitted in any of the areas. These areas would normally occur where a reservoir had been constructed, but could also be developed on a large natural area under the ownership of the Authority.

Class III: Intensive Specific Use Areas — This would include those activities which place considerable stress upon the natural landscape. These areas would have to be owned by the Authority. They could include whole conservation areas, but would be more frequently sub-zoned within a larger multiple-use area. The specific uses would include: (a) picnicking, (b) camping (family and group), (c) swimming, (d) boating, (e) fishing, (f) heavily used natural trail or interpretative locations, (g) playgrounds, (h) fire-arms ranges, (i) archery ranges, (j) dog trail ranges, (k) scenic lookouts, (l) launching sites or water access points, (m) rock-collecting areas, (n) skiing areas, (o) tobogganing areas, (p) skating ponds, (q) sleigh ride trails, (r) skidoo areas or trails, (s) motorbike areas or trails, and (t) scuba diving areas.

Class IV: Extensive Specific-use Areas — These areas would often be for single purpose conservation areas, but some types might be incorporated into sub-use zones in larger multiple-use areas. Hunting might require exclusive use at some seasons.

Use could include (a) archery, (b) rock climbing, (c) motorized tobogganing, (d) cross-country hiking, (e) trail riding or skiing, and (f) hunting.

The development of permanent facilities in this class of area would be permitted in contrast with natural areas (Class I). In some cases this might be the primary difference between the two classes.

It is conceivable that to maintain control over the numbers of people in Class IV and Class I areas, entrance would be by permit only.

Class V: Historic Site Areas — These could consist of sub-zones in a larger area. However, experience has indicated that historic sites often form the focus for the conservation area in which they are located, particularly if a structure is involved. Possible attributes for this class of area include: (a) block houses and defensible houses, (b) sawmills, (c) grist mills, (d) cheese factories, (e) pioneer farms or buildings, (f) blacksmith shops, (g) churches, (h) historic homes, (i) sites of significant events, and (j) historic roads or waterways.

Class VI: Service Areas — This last zone class would be necessary only in intensively used multiple-use areas as an adjunct to Class III areas. It will include service concessions such as refreshment booths, information, supplies, water facilities, change-houses and first aid posts. Specific concessions such as marinas or rental and ski lodges would be found here. A visitor centre, museum, nature school or a significant interpretative facility might be looked upon as a service and the area around it zoned as such.

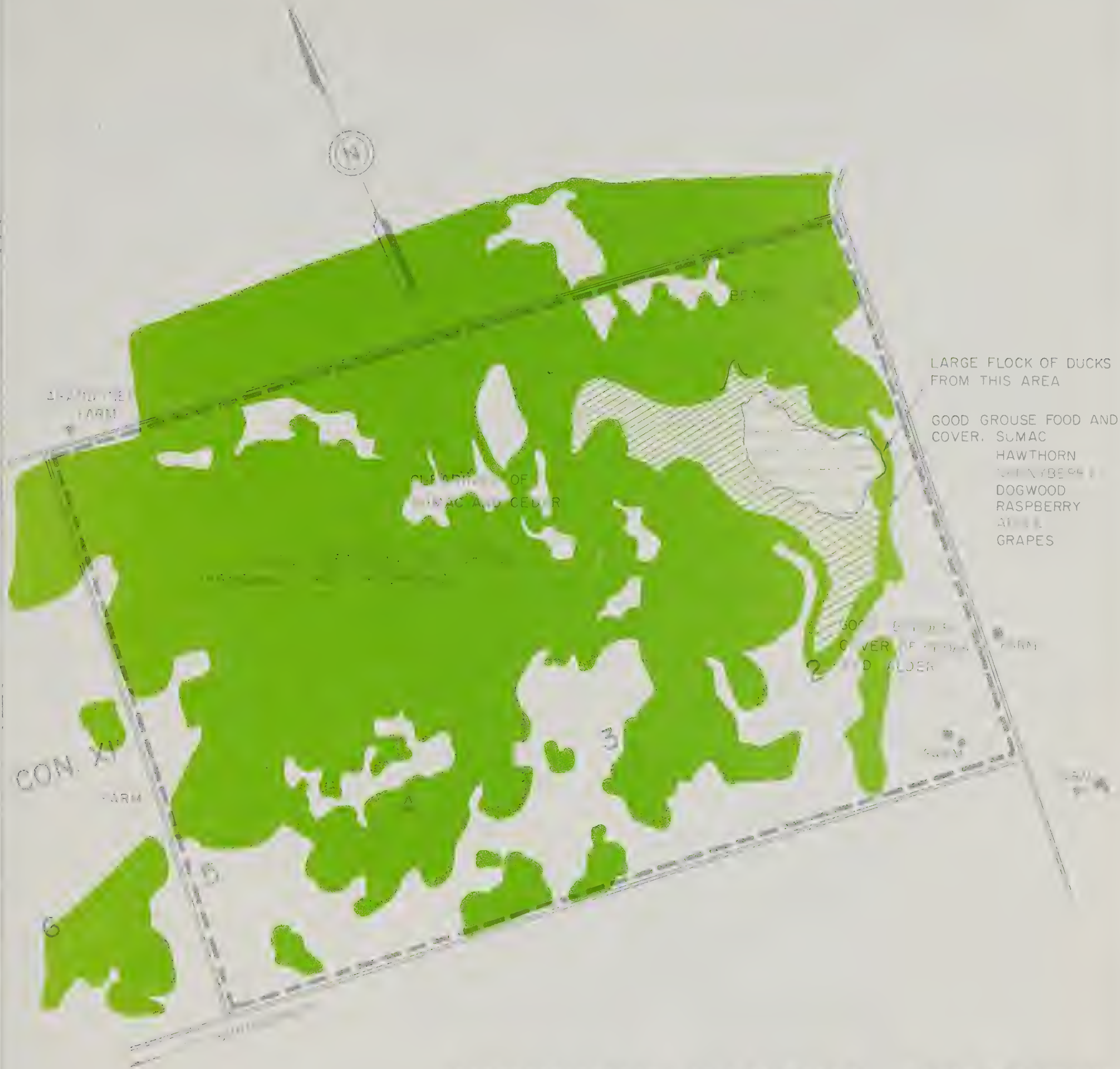
Although the dividing lines between classes of use-zones are somewhat blurred, such a scheme gives the Authority a management tool and lays down guidelines for the public that will enhance their experience as well as their appreciation of the aims of conservation. As use in all areas intensifies. the Authority must be alert to the development of conflicting interests which may require additional regulatory controls.

Table A21-1

LOCATION OF PROPOSED CONSERVATION AREAS

Site No.	Name	Concession	Lot	Township
1	White Island	Rice Lake		Alnwick
2	Viewpoint	II	3	Alnwick
3	Winter Sports	IX	2	Haldimand
4	Dartford Pond	V	11	Percy
5	Viewpoint & Picnic Area	XII	19	Percy
6	Cedar Island	XIII	14	Seymour
7	Boat Access	XI	15	Seymour
8	Viewpoint	IV	19	Seymour
9	Sugar Shack	III	24	Rawdon
10	Harold Recreation Area	VIII	15	Rawdon
11	Rawdon Range	VIII, IX, X	2-7	Rawdon
12	Pancake Hill	III, IV	8-10	Huntingdon
13	Picnic Area and Viewpoint	II	6	Rawdon
14	The Glen Miller Rock	III	A, 1	Sidney
15	Murray Canal Campsite	C	6	Murray
16	The Breakaway	V	5-6	Brighton
17	Norham Pond	I	17	Percy
18	Skiing and Viewing	XL	22-23	Cramahe
19	Lake Ontario Beach	B	10-13	Haldimand
20	Shelter Valley	I	14-15	Haldimand
21	Shelter Valley	I	14	Haldimand
22	Shelter Valley	III	13	Haldimand

WHITE LAKE AND MOHELAND LAKE
PROPOSED
FOREST AND WILDLIFE AREAS
HUNTINGDON TOWNSHIP
LEGEND
SCALE
CON XI
CON. X
CON IX
P
10 11
11 12
12
FARM
POND
OLD GRAVEL PIT



3

PROPOSED RAWDON TOWNSHIP FOREST AND WILDLIFE AREA

LEGEND

WOODLAND
ALDER, WILLOW, SEDGES
SEDGES WITH RODS

1320 660 0 1320
SCALE IN FEET

FIG. 21-A9

CONSERVATION AUTHORITIES BRANCH, Dept. E.&R.M. G.G.G. 1970

PROPOSED CRAMAHE HILL
FOREST AND WILDLIFE AREA
CRAMAHE TOWNSHIP

FIG. 21-A10
CONSERVATION AUTHORITIES BRANCH, Dept. E.B.R.M. 1970

FIG. 21-A11

CONSERVATION AUTHORITIES BRANCH, Dept E&RM GGG 1970

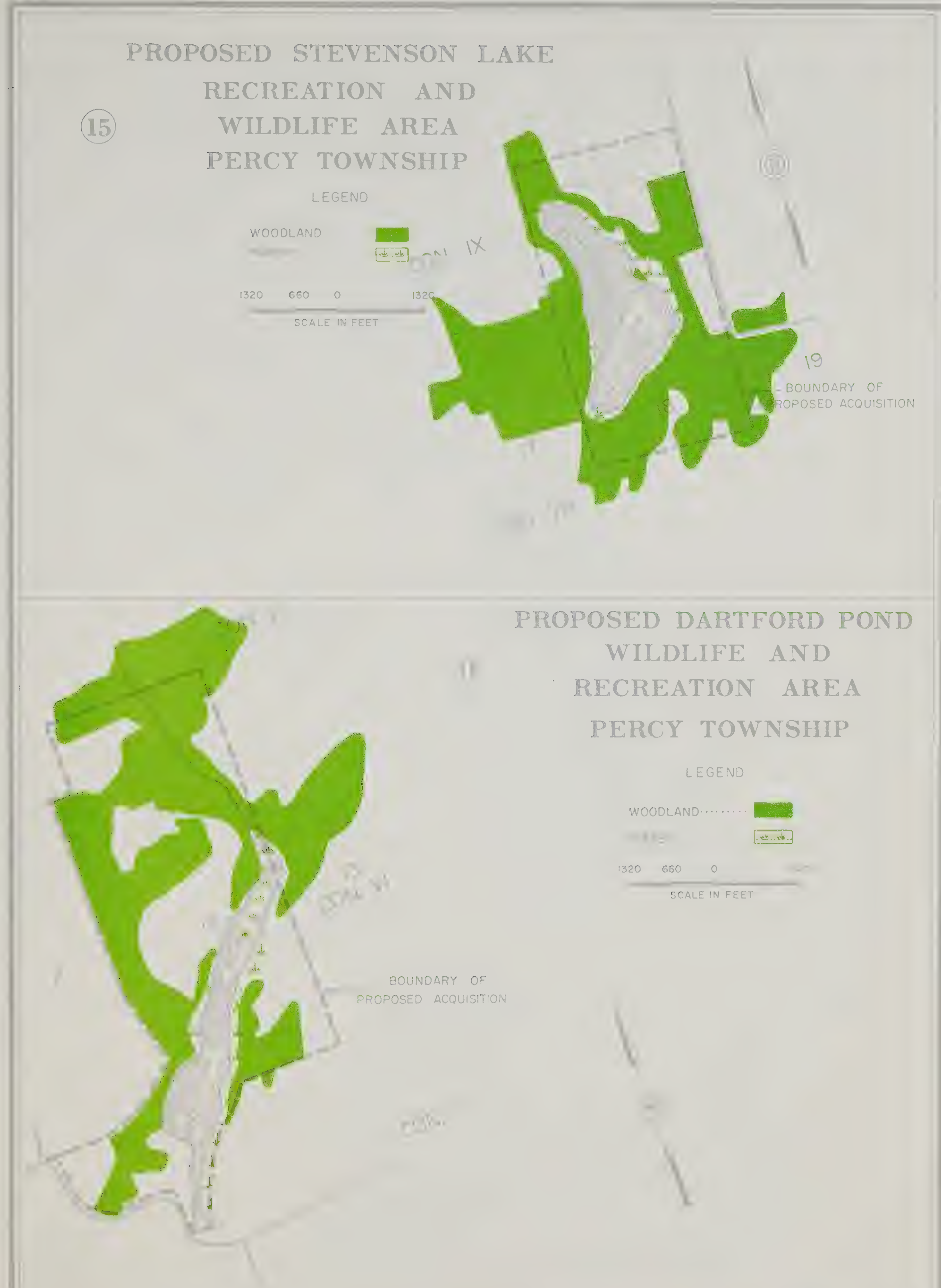


FIG. 21-A12

CONSERVATION AUTHORITIES BRANCH, Dept E.&R.M. G.G.G. 1970

CODRINGTON AREA
FOR PUBLIC HUNTING
AND FISHING
12
LEGEND
1320 660 0
SCALE IN FEET
CON I
CON II
CON III
24
6
FIG 21-A13
CONSERVATION AUTHORITIES BRANCH, Dept. E.&R.M. GGG 1970

FIG. 21-A14

CONSERVATION AUTHORITIES BRANCH, Dept. E.&R.M. G.G.G. 1970

FIG. 21-A15

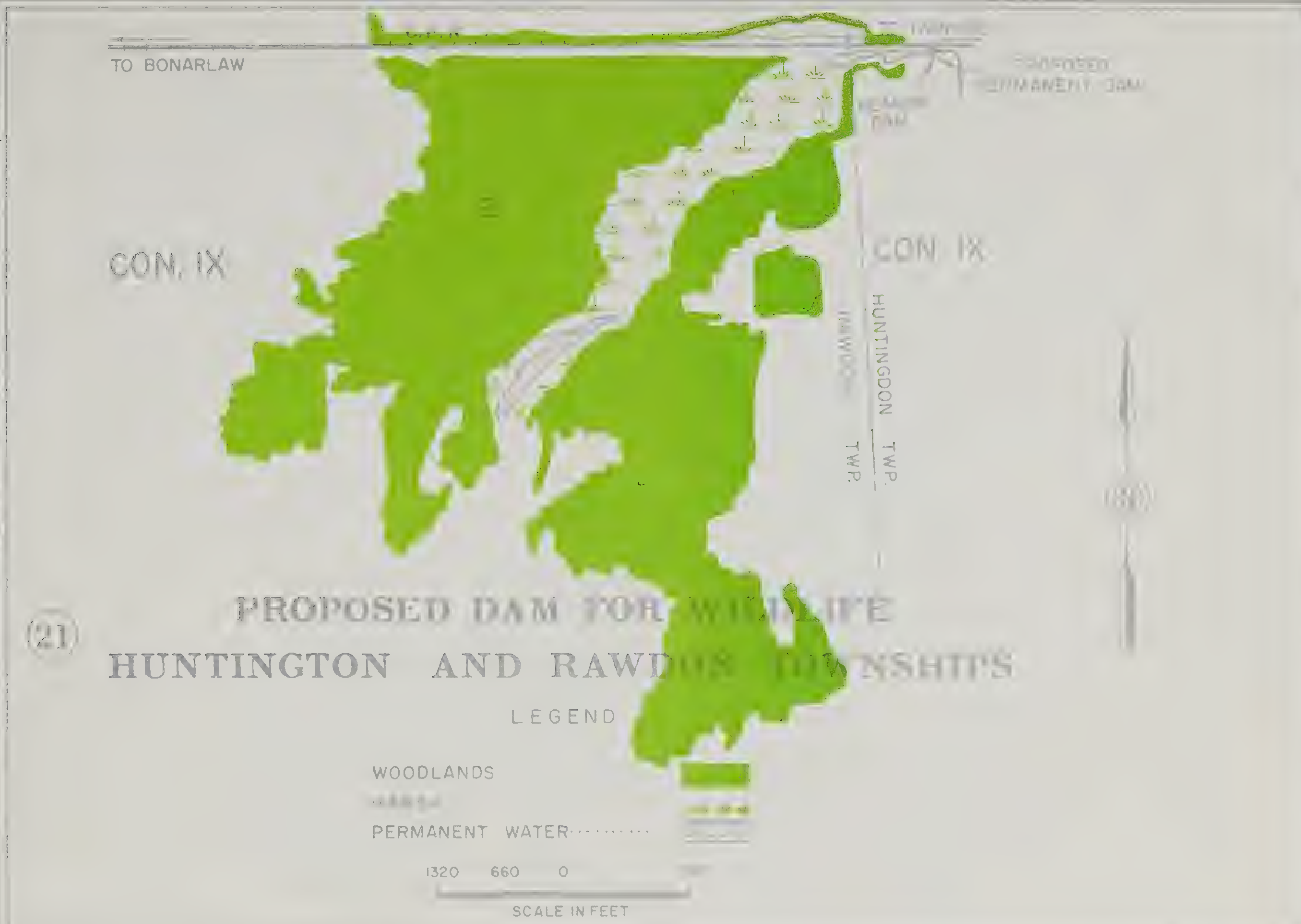
CONSERVATION AUTHORITIES BRANCH, Dept. E.&R.M. G.G.G. 1970

MARSH EAST OF BIDDY LAKE

(19) BRIGHTON AND CRAMAHE TOWNSHIPS

FIG. 21-A16

CONSERVATION AUTHORITIES BRANCH, Dept E.&R.M. G.G.G. 1970



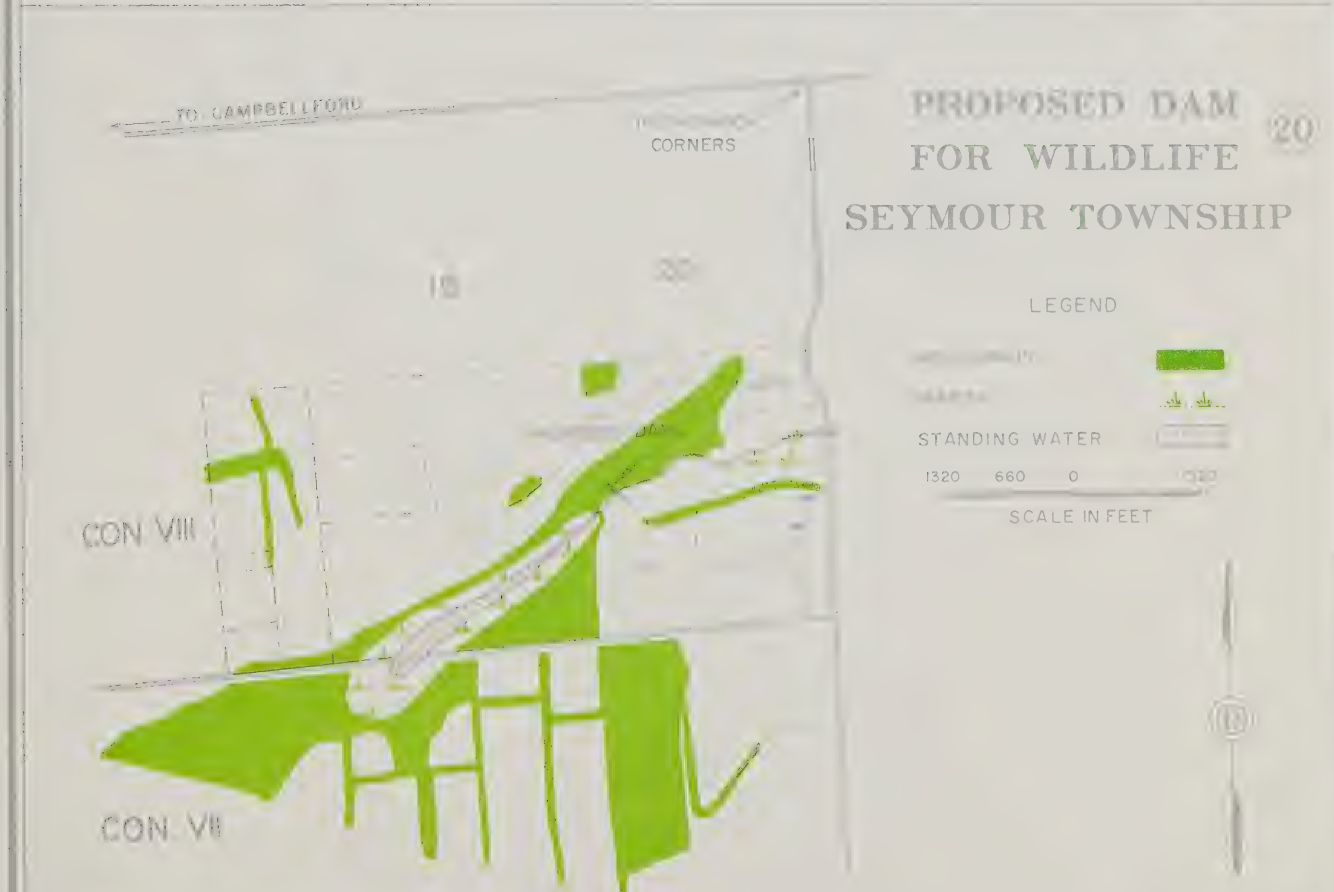


FIG. 21—A17

CONSERVATION AUTHORITIES BRANCH, Dept. E. & R.M. 1970

BREAKAWAY CREEK AREA FOR PUBLIC HUNTING AND FISHING BRIGHTON TOWNSHIP

(22)

FIG. 21 - A18

CONSERVATION AUTHORITIES BRANCH, Dept E.&R.M. G.G.G. 1970

24 OAK LAKE

(SIDNEY TWP)

DEPTH CONTOURS

(OXYGEN CONTENT, 6 p.p.m. AT 25' DEPTH)

SCALE 1000 500 0 1000 FEET

SURVEYED: AUG. 25, 1969

N

(THESE MAPS ARE NOT NAVIGATIONAL CHARTS)

23 BIDDY LAKE

(CRAMAHE TWP.)

DEPTH CONTOURS

SCALE 1000 500 0 1000 FEET

SURVEYED AUG. 25, 1969

N

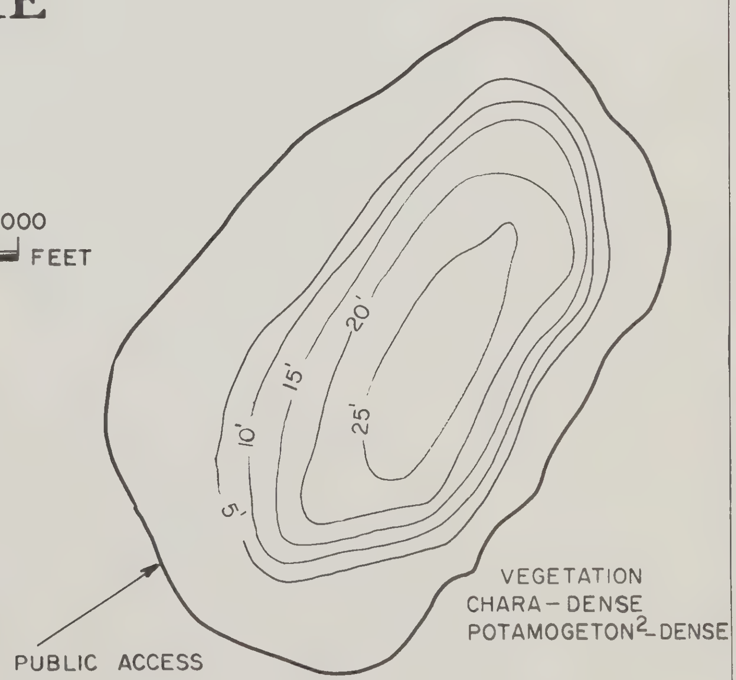
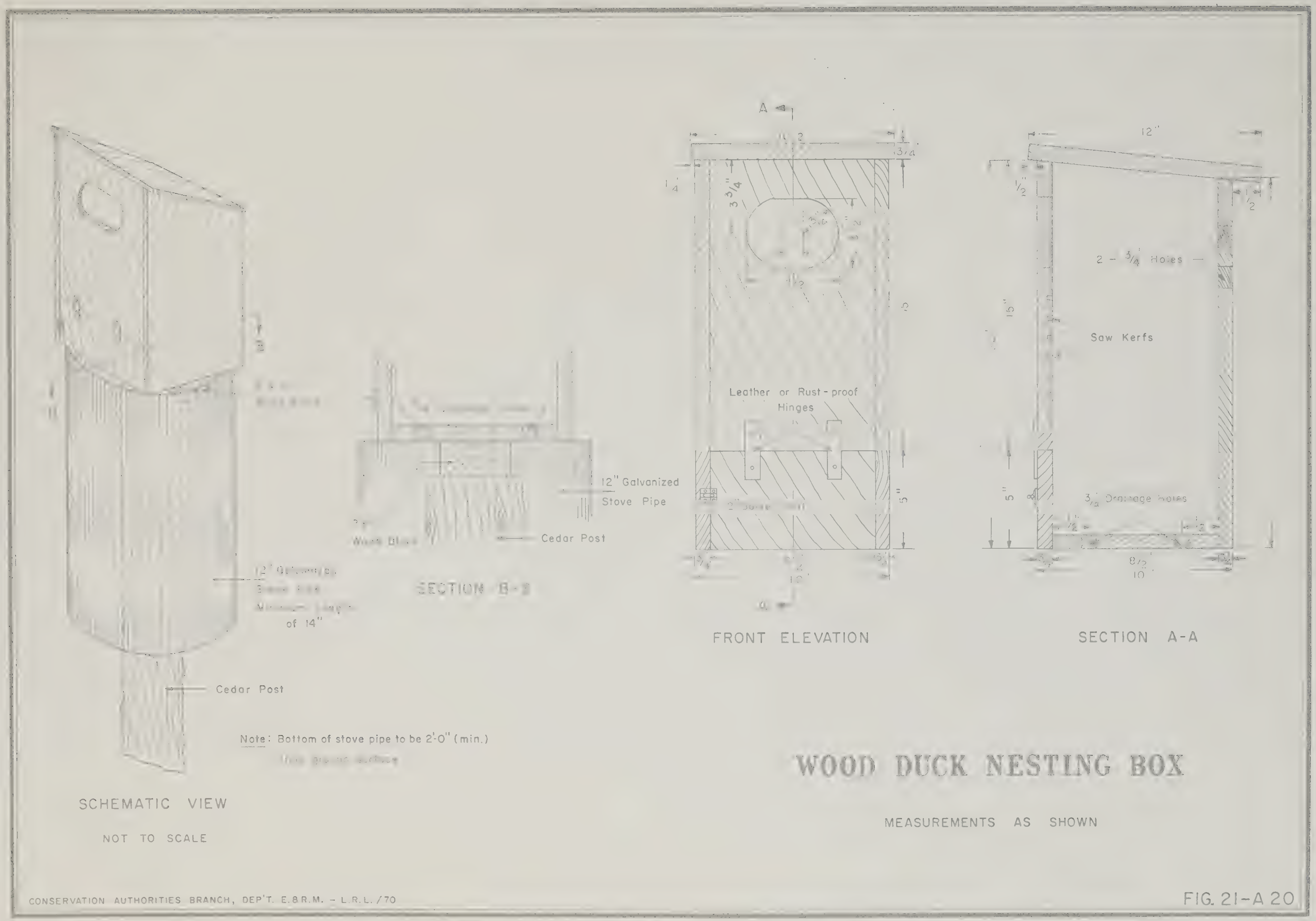


FIG. 21 – A 19

CONSERVATION AUTHORITIES BRANCH, Dep't. E. & R.M. G.G.G. 1970



Cedar Post
Note: Bottom of stove pipe to be 2'-0" (min.)
SCHEMATIC VIEW
NOT TO SCALE
12" Galvanized
Stove Pipe
Cedar Post
SECTION B-B
Leather or Rust-proof
Hinges
FRONT ELEVATION
2 - 3/4" Holes
Saw Kerfs
3/4" Drainage Holes
12"
15"
5"
10"
SECTION A-A
WOOD DUCK NESTING BOX
MEASUREMENTS AS SHOWN
CONSERVATION AUTHORITIES BRANCH, DEP'T. E.&R.M. - L.R.L./70

FIG. 21-A 20

Government
Publications

Government
Publications

Trenton from the air, 1913.

Department of Energy and Resources Management

HON. GEORGE A. KERR Q.C., Minister

J. C. THATCHER, Deputy Minister

A. S. L. BARNES, Director, Conservation Authorities Branch

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CONTENTS

ILLUSTRATIONS

All above illustrations are from prints and paintings in
The Public Archives of Canada collection.

Chapter 1

THE INDIAN PERIOD

They "proceeded to make their way in the woods, so fast that we soon lost sight of them", wrote Samuel de Champlain in the early seventeenth century of a group of his Indian allies. Many of his contemporaries and successors remarked similarly on this ability, amounting almost to instinct, of the Indian to follow effortlessly, and without ever apparently losing his way, forest trails and portages that connected great watercourses stretching for hundreds of miles.

Of all those that led up from Lake Ontario there was none more prominent, although there were others often more convenient, than the Trent which followed much the same course as the great river that had linked the vast lakes Algonquin and Iroquois (which were to form the Great Lakes in post-glacial times).

Inevitably, Indian groups during their wanderings stopped along the Trent's banks. Some of the Indian remains, including the well-known mounds at Rice Lake, have been attributed to a so-called Hopewellian culture that is believed to have been based on cultivation of corn, beans and squash, and to have been widespread some 2,000 years ago.

More recent research by Dr. J. V. Wright (which he has chosen to call a 'synthesis' of the work of many others in Iroquoian studies) of the National Museum suggests that there is an identifiable Ontario Iroquois Tradition — in which the Indians of the Trent River participated — which interacted with a north-eastern co-tradition at the same time that it developed through a number of cultural stages that were first diverse, then one, and then diverse again, concluding with the historic Iroquoian tribes known from Champlain's time. The whole of this process, claims Dr. Wright, can be traced over the six and a half centuries of pre-history from 1000 A.D.

The earliest of these stages, labelled simply 'Early Ontario Iroquois', lasted for approximately 300 years to 1300 A.D., and consisted of two branches, the Pickering, in which the Indians of the Trent Region were included, and the Glen Meyer which developed independently to the south-west. Indians of the Pickering branch lived in small camp-sites by fishing areas or in larger, palisaded villages sited on hills, apparently for defensibility and, probably for the same reason, some distance away from navigable waters. They depended on fishing and hunting for subsistence, and cultivated only corn as a crop. In time they began building the rectangular, wooden long-houses that were later regarded as an identifying characteristic of the Iroquois.

Pickering pottery remains have been found near Trenton, and sites have been excavated on islands in Rice Lake, off Shearer Point, and to the north and west of the Lower Trent Conservation Authority boundaries.

The second stage, the 'Convergence' or 'Middle Ontario' one, lasted only for about 100 years to 1400, and resulted from the submersion of the south-westerly Glen Meyer branch in the Pickering. This 'Middle' stage had, in turn, early (Uren) and late (Middlepoint) sub-stages, but the differentiation is largely

a technical one, based partly on the development of an elaborate clay and stone pipe complex. Tobacco was grown but corn remained the sole cultivated vegetable crop. There was apparently a greater reliance on it as the Indian population grew rapidly. Sunflower seeds were apparently introduced as a supplementary food source. Refuse heaps show that fish (salmon, trout, pike, sturgeon, suckers, smelt, perch and other species) remained a major part of the staple diet, but practically every type of animal, bird and reptile was hunted as a supplementary food source. Bones of deer are the most common but those of beaver, dog, bear, raccoon, marten, muskrat, porcupine, otter, fisher, mink, squirrel, rabbit, hare, woodchuck, lynx, moose, wolf, skunk, wolverine, turtle and fox are also frequently found.

From approximately 1400, the Middleport culture changed to a diverse 'Late Ontario Iroquois Stage' that produced the historic Huron, Petun, Neutral and Erie tribes. Above Lake Ontario there were southern and northern divisions of the Huron-Petun branch, which remained relatively isolated from each other until perhaps the middle of the sixteenth century when, the southern group having moved slowly up the Trent and the other river systems, the two divisions gradually blended.

Corn became the one necessity of life. It was, wrote the historian of the Recollet missions, Gabriel Sagard, in 1632,

> "the soup, the meat and the daily food, and there is nothing more to expect for the repast; even when they have a little meat or fish to distribute among them (which rarely happens, except at the time of hunting or fishing) it is divided and eaten first."

From the early fifteenth century, squash and beans were also cultivated as supplementary crops. Animals and birds, rare though they were at certain seasons as food sources, were made to serve other purposes. Bird bones were frequently fashioned into awls, beads and projectile points, and bone fish hooks, needles, pendants and wristlets were also common. Similar articles were made from polished stone, as were adzes and other tools.

The larger, five to twenty-five acre palisaded village sites, still chosen to avoid too close approximation to navigable water, were often surrounded by fields of corn to the extent that Sagard, for one, found that "I usually lost my way in these corn fields, more than in the prairies and forests". But such extensive cultivation inevitably and quickly exhausted the soil. For this reason, and because it became more and more difficult to find supplies of firewood in the immediate vicinity, new sites had to be found every 10 to 20 years for the larger villages. The task of re-building when this was the case was that of the men.

The 8 to 9 feet high palisades were generally made of 3 rows of wooden stakes, laced one into the other, with an inside lining of thick bark and with large tree trunks laid lengthwise at the base. Longhouses were built 9 to 12 feet apart within these enclosures, and measured anything from 11 to 200 feet by 20 feet, and were roofed with tree bark. Construction completed, the men would confine their activities to tobacco cultivation, to making weapons, canoes and fishing nets, and to fighting, hunting and fishing, leaving to the women the tasks of tending to the other crops, making pottery, and - the major one - gathering firewood.

Influences were not, of course, limited entirely to one cultural source. There is ample ethnological, linguistic and archaeological evidence to show that the Iroquois of the north-east, including the Five Nations settled in New York State, shared similar patterns of development.

In fact, even before Champlain's arrival in the first decade of the seventeenth century, contact with the Iroquois of the Five Nations apparently reached a point where the Ontario Iroquois, or Huron-Petuns chose to leave the area above Lake Ontario as a buffer zone, and to retire northwards and westwards away from Iroquois groups who crossed as warriors and hunters rather than cultural representatives.

When Champlain, to safeguard his infant colony and the fur trade in which the Hurons were the essential commercial middlemen, sided from the first with them and their Algonquin allies of the Ottawa River areas in campaigns against the Five Nations Iroquois, the ultimate effect was to throw the whole area above the Lake into a maelstrom of confusion from which the Ontario Iroquois tradition never recovered.

In his major campaign, that of September 1615, which was intended as a show of force in the heart of the Five Nations' territory below the Lake, Champlain journeyed first to the thickly populated historic homeland of the Hurons in Simcoe County and, with the collected Indian armies, then made his way south by way of the Trent. He noticed as he went the "five falls, some being from four to five leagues long", and the "lakes of considerable size" which were "very abundant in good fish", and with banks that looked "as if the trees had been set out for ornament in most places". There were numerous "vines and nut-trees", and it seemed to him "that all these tracts were in former times inhabited by savages, who were subsequently compelled to abandon them from fear of their enemies".

Bear and deer were plentiful in the region - the party stopped frequently to hunt on its way down - as was small game and "many cranes, white as swans, and other varieties of birds". Elsewhere he remarked on the "extensive and lofty forests", and the "meadows, lowlands, and marshes" where all kinds of wildlife were to be seen.

But although the Hurons and Algonquins in 1615 were still able to hunt fish in comparative safety along the Trent system and in surrounding areas even this became difficult as the Iroquois of the Five Nations, supported by the Dutch and then the British, invaded the territory in larger numbers and for longer periods to harass, to hunt, and to ambush the fur-carrying flotillas of Hurons and Algonquins as they made their way to the French trading centres.

Lake Ontario and the St. Lawrence route were from the first practically impassable. "It is true", wrote Jean de Brebeuf in 1632, "that the way [to Huronia] is shorter by the Saut de St. Louys and the Lake of the Hiroquois [Ontario], but the fear of enemies, and the few conveniences to be met with, cause that route to be unfrequented". Then even the Ottawa route became unsafe, together with the land and water trails that led into the two great river systems. The Trent, because of the easy access by connecting waters to Lake Simcoe and the Huron heartland was, for a time, virtually a military highway for the

Iroquois of the Five Nations. Eventually, in 1649, the Huron's main village was destroyed and the survivors fled to neighbouring tribes, northwards and eastwards, to the safety of areas controlled by the French.

For a decade and more afterwards, the area entered by the Bay of Quinte and the Trent was used by the Five Nations principally as a hunting ground for the beaver skins which they sold to the British and Dutch on the Hudson. For decades it was, in fact, common to label on maps the area from the Bay of Quinte upwards to Georgian Bay and as far as Lake Nipissing, as "the beaver hunting ground of the Iroquois".

In the mid-1660's, after major military expeditions by the French, a truce of sorts was made and small groups from the Iroquois villages to the south of Lake Ontario migrated to the north shore. A major offshoot of the Cayuga Nation set itself down somewhere in the region of Weller Bay and the Murray Canal — so the available evidence would reasonably seem to suggest — perhaps as far north on the Peninsula as to-day's Carrying Place, but possibly also near to where Consecon or Bloomfield now are.

As Kenté (meaning "a meadow") the village appeared prominently on maps from this time onwards, its position shifting more apparently according to the cartographer's art than was likely really to have been the case, even allowing for the Indian habit of moving sites every decade or so. Whether generally just inside or outside the boundaries of the present Lower Trent Conservation Authority, however, Kenté certainly had smaller outposts and campsites which were located farther up the Bay and River towards Trenton and beyond, as well as to the east and west. One Wentworth Greenhalgh, writing of a journey he made in the vicinity of Lake Ontario in May 1677 (or a decade after the village's establishment), recorded the inhabitants as "Seneques", or Senecas (the Cayuga's Five Nations neighbours), and listed three other "towns" apart from "Keint-he" - Canagora, Tiotohalton, and Canoenada. Kenté, he wrote, "contained about 24 houses, and was well furnished with corn".

Following along the Tannaouate (as the Trent, in various spellings, was known) the Cayugas built villages near to where Trenton now is — apparently known by the same name as the river — and at Rice Lake in the vicinity of Webb Bay, to which the name Kentsio, or "abounding in fish", was given. Yet others settled at a short distance to the west on the Lake Ontario front, at a village named Ganeraske which has been placed on Presqu'Ile Bay but was almost certainly on the site of Port Hope and the foot of the portage to Rice Lake.

Members of the other Iroquois nations also set up villages at greater distances away, so that maps of the period showed the "Northern Iroquois" as established inhabitants of the north shore.

The Cayugas, like the Mohawks and the Oneidas, and to assure the French of their pacific intentions, invited missionaries to their main village of Kenté and, in 1668, two Sulpicians, Trouvé and de Fénelon arrived there. Prior to leaving Quebec, they obtained a land concession, with building, farming and fishing rights on the Bay of Quinte, along the Trent, and territories then hardly known as far as Georgian Bay. They lived on the Indians' staple corn, squashes and beans for much of the first year, during which the Cayugas were at one point reduced to searching for mushrooms.

By the start of the 1670's, however, the missionaries had a flourishing farming settlement of several hundred acres on land which they found to be "very fertile", especially for growing both corn and wheat and "Pulse, Pot-herbs, gourds and water melons". Their poultry and cattle, they also recorded, "multiply'd extremely". The bloom was not long-lived. Intensive agriculture was not Indian practice, and the land around the Cayugas' village was said to be so poor some years later that few of them would agree to stay long on it.

The missionaries, too, were not able to cope satisfactorily with the comings and goings of the Indians, the ridicule to which they and their small number of converts were frequently subjected and, increasingly over the years, the Five Nations' hostility to all things French. Despite talk of the "edge of the lake of Tannaouate" being a superior place for a mission, Kenté by 1677 was "entirely deserted...having no more than the old people left there", as the Sulpicians recorded, and in 1682 the missionaries completed their abandonment of the dormant village and its outposts.

The economics of the fur trade had much to do with the depopulation of the Cayuga village at this time. Since taking over the beaver hunting grounds and much of the trade with the Algonquin Ottawas from the Hurons, the Iroquois of the Five Nations were in the habit of crossing Lake Ontario in small groups by Wolfe Island and going in search of furs by way of the Bay of Quinte and the Trent.

To this the French authorities had no objection, provided that the furs were brought to centres favoured by them, one of which was Kenté. Frequently, however, Dutch and British traders waited at the foot of the portage from Rice Lake, where Port Hope now is, and at the mouth of the Rouge River farther west, and their trade was certainly more lucrative and included as well no strictures on spirits. Even without this interception, vast quantities of furs were taken by the Iroquois across Lake Ontario and to the Hudson. For the Cayugas of Kenté there was more point in participating in this trade, however far afield it might take them and no matter how illicit it might appear in French eyes, than in sitting quietly at Kenté to deal with recognized traders or, for the same purpose, going only to Montreal and Three Rivers at the specified season.

The losses were so serious by the 1670's that the French authorities felt practically obliged to produce a solution or forfeit the trade almost entirely. To a succession of governors and advisors the best approach seemed to be to build a post which would serve the double purpose of attracting and policing the trade, and the Kenté area, covering the heavily used Trent route, was one of the preferred locations. It was with this in mind that Governor Frontenac, in June 1673, set out from Montreal with four hundred men and an armada of bateaux and canoes to meet with chiefs of the Five Nations who had been previously warned by La Salle to assemble at Kenté. Reports of their disgruntlement at Frontenac's selection of Kenté, which they interpreted as a slight to themselves and their own main villages, led Frontenac to suggest that they meet him instead near the mouth of the Cataraqui at a site which he felt would serve quite adequately for the strategic purpose of watching "the Indians pass by who crossed the lake to go into the river of Tanaoate (the Trent), and also those who seek rivers which are below the mouth of the lake to get to the lands in the North". Consequently Fort Frontenac was built there instead of "higher at Oanneiouts

[an Oneida village in the vicinity of Hay Bay or Napanee] or at Kenté."

The ploy was momentarily successful. The chiefs were both mollified and impressed, and by the end of the next year Frontenac was able to report that: "never since the French have been in Canada have so many Indians come down to Montreal as we have seen this summer". Despite its displacement as the major point of call on Lake Ontario, however, Kenté did not die. Instead it and its outposts on and at varying distances from the Trent managed to maintain a precarious existence that depended on mobile populations and itinerant traders.

The peace failed again during the next decade and, in 1687, Governor Denonville undertook a punitive expedition into what is now New York State, stopping at Kenté and other main Iroquois villages along the Lake Ontario Front and by force of arms and example reduced the attractiveness of the Kenté area for the Iroquois to the point of almost complete abandonment.

Contributing to the effect was the movement of the main beaver hunting grounds farther northwards and westwards. By the early 1700's, when the Iroquois were temporarily pacified, few French traders could be bothered at all with the St. Lawrence route, finding the Ottawa to be more convenient, and consequently there was little commercial activity in the Kenté area.

Coincidental with these discouragements to continued occupation by the Cayugas and the other Iroquois tribes of their northern villages, there was a southerly migration from the Manitoulin Island and Mississagi River area of Algonkian-speaking Ojibwa Mississaugas. They were traditionally migratory peoples who lived in dome-shaped wigwams covered by bark or rushes, and subsisted on wild rice, berries and maple syrup varied, at appropriate seasons, with fish and meat.

The time and nature of their expansion into territories, claimed by the Iroquois as their own, is not clearly known. According to the sworn statement in 1904 of Robert Paudash, the descendant of a long line of sachems or chiefs, the traditional lore of the Mississaugas was that they drove the Iroquoian "Mohawks" (in fact the most easterly of the Five Nations) from the Lake Huron region to Lake Simcoe and then to the Trent "where they [the Mohawks] were settled in numerous villages", Rice Lake and "Onigaming, the famous carrying place" near to the present Murray Canal. After an expedition south of Lake Ontario, said Paudash, the Mississaugas agreed to terms with the Iroquois nations that included inter-marriage and therefore hopefully a long peace. Then they returned to the north shore and "seeing that the land conquered by them from the Mohawks, who had dispossessed the Hurons, was full of game and an excellent hunting-ground, they came down from Lake Huron and settled permanently in the valley of the Otonabee, on Trent, and along the St. Lawrence."

French records show that, when Fort Frontenac was rebuilt in 1695, there were already groups of Mississaugas for large distances around who were willing to trade at Kenté and elsewhere.

Apparently with some cartographic licence a 1689 map of "Canada or New France" showed "Les Missisaghe peup" as poised on a line from the Muskokas to the Haliburton Highlands. As late as the 1750's and 1760's other detailed maps showed the "Messesagues" as still in the Lake Huron region,

"Subdued by the Iroquoes [sic] and united to them", and being "the 8th Nation in that League". It is known, anyway, that at a great assembly of chiefs at Albany in August, 1746 the Six (as they by then were) Nations informed the British Commissioners that "they had taken the Mississaugas as a Seventh Nation".

The relative positions of conqueror and conquered required, apparently, a flexible outlook! In fact the Mississaugas seem to have been involved very little in the intricacies of the French-Iroquois relationship, and to have had the ability to avoid seriously offending either group. In a letter of 1708, by way of example, Clérambault D'Aigremont remarked that a group of Mississaugas had destroyed a small Iroquois village on the lake front some years previously, yet visited it when it was rebuilt. But despite the relative security of their situation they remained few in number. In his 1734 "Memoir on the Indians of Canada", for instance, Chauvignerie noted that the Mississaugas were "dispersed along the shore at Kenté" and vicinity, as well as westerly "to the number of one hundred and fifty in all".

About 1720, Dagneaux Douville, a licensed trader and member of an established Canadian family, was authorized to build a post at the "bottom of the Bay of Quinté", apparently in the region of Carrying Place or near to the entrance of the Murray Canal. Few Montreal fur traders were still then listed as visiting the area compared with other parts of the French territories. Douville, however, had no more success than many of his predecessors in exchanging with the Indians his knives, axes, powder and shot, mirrors, ribbons, combs, buttons, shirts, pepper, lard, flour, olive-oil, tobacco, vermilion, and so on.

The lure of the cheaper English goods and brandy at Chouagen (Oswego) was too strong for Mississaugas and Five Nations Indians who were not virtually escorted to the French posts, and substantial and increasing losses continued over the years. Nevertheless, Kenté seemed continually to recover from a pending demise because of its position as virtual entrepôt of the Trent system, and also with the help of a little judicious brandy trading justified, as a last "Official Report on the French Posts in the Northern Part of North America" written between 1758 and 1763 remarked, "because the English give it".

After the Niagara post had been surrendered in 1759, and shortly before the fall of New France, the Mississaugas formally pledged their allegiance to the British and promised to hunt and fish for them as well as to trade with their agents.

This expedient move had certain rewards in the years ahead, but with the change in regime and frontiers, Kenté's existence was threatened once again. Sir William Johnson, who was given nearly a free hand in Indian affairs by the British administration, had long-established connections with Albany fur-trading interests and favoured them over those operating from out of Montreal.

But the lure of the mouth of the Trent remained. In 1767, despite his efforts, Sir William Johnson complained that a number of persons from "Canada" (i.e. the old centres of New France) were "trading with the Indians on the north side of Lake Ontario, and up along the rivers in that quarter, which, if not prevented, must ruin the fair trader".

Political turmoil in turn brought an end to Albany's aspirations and, in 1783, a number of Scottish and French fur-traders finally pooled their assets to form the famous North-West Company which controlled the trade far into the interior for many years.

The Company, not happy with the "eminently dangerous" Ottawa route to Lake Huron, early considered making the Trent its main thoroughfare from Lake Ontario. Benjamin Frobisher, one of those instrumental in the Company's founding, reported to Lieutenant Governor Hamilton in 1785, that "all my endeavours to acquire knowledge of it (the Trent route) are far from being satisfactory".

He had been able to meet with only one person who had reached Lake Huron by way of the Trent, "and that so far back as the year 1761". At second hand he had learned of the existence of Mississauga villages where Indian Corn and other types of grain were cultivated, and of lands which "abound with good Wood and are generally fit for cultivation". Between the Bay of Quinte and Rice Lake there was said to be "plenty of Water for Boats of any Burthern", but the connecting links from there to Lake Simcoe (or "la Clie") were considered "totally impracticable". The lack of information, however, bothered Frobisher, and he believed that "a Project that holds out so many advantages to the Province at large ought not to be relinquished until it is found upon survey to be represented as really impracticable".

That was to be a recurring theme, as the following pages will tell. In the meantime, amid the fortunes of colonial and Indian wars, and despite Sir William Johnson's informing the British government in 1763 that the Five Nations claimed most of what became Ontario, "including the Mississauga country", the Mississaugas succeeded in retaining both in fact and in the eyes of the British possession of a large territory that had at its core the Trent waterway and its connecting system.

Consequently it was from the Mississaugas that the British after 1783, with the loss of the American colonies to the south, purchased the lands along the Lake Ontario front that were to provide settlements for the political refugees. In the spring of 1783 the Governor, Sir Frederick Haldimand, sent his Surveyor General, Major Samuel Holland, "to Cataraqui to examine that Place and Country upwards", and after his own rapid investigations Holland in turn ordered a survey party to continue looking at the country "all the way to Niagara".

Details of purchase were left to Captain William Crawford, seconded from Sir John (Sir William's son) Johnson's Indian Department. In October, 1783, and in later treaties between 1784 and 1788, Crawford completed the acquisition on the Crown's behalf of most of the area that is now within the boundaries of the Lower Trent Valley Conservation Authority.

Chapter 2
SETTLEMENT AND EARLY ENTERPRISE

The purchase agreements at first apparently made little real difference to the ways of life in the Trent Valley. Members of the Six Nations who had sided with the British during the American Revolution were settled by them on the Bay of Quinte, but the Mississaugas, with a large encampment at Rice Lake and smaller sites elsewhere, came and went as before, trading with such persons as Jean Baptiste Rousseau and his partner, McLean, who in 1787 were listed as operating "in the Bay of Quinte and the regions thereabouts".

But if the trading houses saw in the Trent only a commercial highway of great potential, the authorities had other ideas. In the 1780's, when strategic considerations loomed large and communications were all-important, the route by the Trent, despite the meanderings of the river and the connections to Lake Simcoe, seemed to promise a relatively unobstructed and direct communication from Lake Ontario to Lake Huron.

After an initial and apparently rapid survey in 1785 by a Lieutenant Kotté, who was responsible for much of the early land surveying that followed the influx of Loyalists in 1783-84, the project was held in temporary abeyance until a few years later, when it was taken under the special consideration of the Deputy Surveyor-General, John Collins.

Collins, who was probably more concerned than anyone with the overall planning and implementation of the first surveys from the St. Lawrence to Niagara, produced in October of 1790 "A Plan of the District of Nassau in the Province of Quebec..... Pursuant to an Order in Council of the 22nd day of February, 1790" that dealt in greater detail than others up to that time with the portages and communications of the Trent Valley route to Lake Huron, as well as other routes.

It was a long portage from the vicinity of modern Hastings to the river near the future Percy Boom, but it was necessary only for those who wished to avoid the northwards and then southwards curve of the river, and the falls and rapids in that stretch, when travelling between the two places. The trail was nearly nine miles long and passed through an "Excellent Country for making a road", which, as Collins pointed out, would "shorten the distance thirteen Miles", and make unnecessary three other portages.

The river route was also investigated. At what is now known as Healy Falls, Collins noted a "twelve feet" fall and a "good" path of just over a quarter of a mile across the carrying place. Before the bend in the river leading downstream to present-day Campbellford there was another portage, "six feet high" with a "level and good" pathway of exactly a quarter of a mile. The next was at what was later named Ranney Falls, described by Collins as a "Beautiful Fall of fifteen feet high" with a "bank at Landing [of] three feet, the carrying place on the opposite side... being forty chains [half a mile] in length, and a good level road to where you embark". Near to the future Percy Boom he remarked on the

"Salt Spring [which] discharges into this River", and that "Three gallons of the Water makes one gallon of Salt, the Natives make great Quantities of it".

The effect of Collins' work, however, together with the mapping and surveying efforts of others, including regular military officers, was to effectively confirm for the time being that the shortest route and therefore the most practical route to Lake Huron, particularly if there was to be any road building, was by way of the Toronto carrying place to Lake Simcoe. The Trent route, by comparison, had too many natural obstacles that in the circumstances and with the carriage methods of the time hardly seemed worth the bother to surmount artificially.

Settlement too, in the 1780's, did not really extend beyond the Western limits of Sidney Township and was short of the eastern banks of the Trent, making it difficult to justify much in the way of immediate local improvements. According to William Canniff, whose "History of the Settlement of Upper Canada" has served generations of historians, only four families were known to have lived west of the Trent in the early years of settlement--the Bleekers, Huffmans, McDonells, and McArthurs.

With the most pressing problem being the settlement of the Loyalists in the vicinity of Kingston, it was not until 1787 — some four years after the first arrivals at the military settlements — that Sidney, as the most remote, was surveyed. Kotté, who was responsible for the survey, completed his work to the point where the choice front concessions could be granted. But, as with the earlier townships and those that were to follow, the running of side lines and details as to the width, depth and consequent size of lots were considered so questionable that re-surveying was necessary by the turn of the century, and again in the first part of the nineteenth century by surveyors Benson and Rankin. Robert Gourlay, a well-known social critic of the time, attributed the mistakes to the "haste to get land surveyed and given away, [so] that ignorant and careless men were employed to measure it out..... what blundering has been committed, and what mistakes stand for correction".

The judgement, although with a basis in fact, was doubtless purposefully exaggerated to prove a point in Gourlay's usual fashion, and therefore took little account of the difficulties that surveyors frequently mentioned when running their lines from the shore to and from indeterminate markers in often nearly impassable and almost always unknown country.

Apart from sickness -- as with Seth Watkins' crew in Haldimand in August and September 1795, when the "Billious Cholick" laid every man low, delay and difficulties resulted from the numerous cedar, and sometimes ash, swamps throughout much of the area that made for guesswork rather than precision in measuring.

Richard Birdsall, in Cramahe from June to August 1824, for instance, observed for the record the difficulty that he had with "very bad running [the line through] a great deal of swamp and a thick growth of bushes", a task which had hardly been made easier by "some difficulty in find [sic] the S. W. corner of Cramahe" supposedly made by a previous surveyor, obliging him to use a beech tree as a new marker.

Timber raft on the St. Lawrence route.

Probably partly for reasons of impenetrability, as he had discovered for himself, he found on this occasion also territory that had "been very erroneously chained, the concession lines run from East to West and from West to East". He had much the same problem with cedar swamps when he came to survey Alnwick Township in 1826, as did Samuel Benson and his crew who were confronted time and again by "very bad swamps" when they surveyed Huntingdon and Rawdon some years later, in the 1830's.

Despite such problems, however, the surveyors generally found time to fill what was to all intents and purposes a second function, the description of the land that they passed through. Early surveys, in Sidney for example, agreed that the soil there was "good" or, where there were swamps and excessively wooded areas, "capable of being worked", the "barren sandy plain" in the seventh concession apart. During the first survey in 1794 of Rawdon — then one of the back townships considered to be wilderness pure and simple — William Hambly concluded that it had soil "as fine as any I have seen", notwithstanding an often uneven and hilly formation.

Huntingdon, the adjoining township, was thought to be much the same, although with better land in the back concessions and an over-abundance of stony and swamp land.

Alnwick, when it was fully surveyed in the 1820's, was judged to be generally level and to have a not overly heavy vegetation, but to be too stony and swampy with few good lots.

Seymour, in the several surveys that it had to the 1830's, was described as hilly but arable, on the whole with "good land" alternating with "thin soil, wet & swamp & stone" in most concessions and with some sandy loam.

The front townships were said to have a usually "good aspect" for agriculture, with the exception of the large sand ridge that extended through the rear concessions of Haldimand to Cramahe.

Stretches of hundreds of acres at a time of oak and pine grew throughout the watershed on sand plains as well as on high ground and in areas of thin soils. Here and there they were interspersed with other hardwoods. Predictably, maple, elm and basswood with quantities of accompanying ironwood were especially abundant on better soils, with lesser amounts of birch, ash, cedar and poplar.

A surprising infrequency of mention of beech in the available reports was, as likely as not, due to a preference to denote coverage by reference to the other major tree types that were probably more common. The species could hardly have been absent. Beech was, in fact, one of the important indicators of land quality for the pioneers, whose rule of thumb had it that "if Beech be the only wood or the prevalent one, you can be sure that the soil is light". And light soils, of course, were not altogether unknown in the Trent Valley.

Not that this was necessarily the main concern with each of the persons who established ownership to lands in the watershed. By 1790, when Picton Bay was still commonly thought to be the final outpost of civilization, it became clear to some that, despite official discouragement of and indifference to emigration from Britain, it was only a matter of time before settlement would move much farther westwards.

A number of the original Kingston area settlers applied for and received grants of land in the Trent region, though there was little likelihood that they would ever improve it themselves. Michael Grass, for instance, often thought of as the founder of Kingston, held 2,000 acres in Sidney township. Officers from the disbanded regiments particularly vied with one another for favourable locations that surveyors uncovered, especially when they were obviously suitable for mill sites or for trading with Indians.

Sometimes, too, locatees who held grants of land as qualified veterans or Loyalists, transferred lots that they regarded as being in the middle of wilderness to persons who were in effect speculators and paid either with a little ready cash, goods of various kinds, or even rum and brandy. In short, it was commercial opportunity rather than the log cabin and clearing in the forest that frequently made the lands of the Lower Trent attractive.

Absentee landowners, of course, left little mark. Local entrepreneurship, however, was a different matter. One of the first in the latter group was Captain A.H. Myers who, in the 1780's, squatted in Thurlow township before it was surveyed and, sometime around 1788-89 — when a party of about 50 Loyalists arrived directly from the States to settle the area east of the Trent — moved on to Sidney, after which he journeyed backwards and forwards between the sites of Belleville and Trenton as his enterprises took him.

For a few years after 1784 the only grist and saw mills in the new settlements were at Cataraqui, which involved an arduous journey of up to sixty miles for those coming from places west. After 1787 a grist mill at Napanee made matters easier for inhabitants of Sidney, but Myers made even this journey unnecessary when he built first a sawmill -- the simpler of the two types to construct -- and then a grist mill in 1794-95 on the creek which bears his name a few miles east of Trenton.

He also made bricks on the site which were used to build himself a large house at Belleville the same year. Some of them undoubtedly also had wider distribution, as Myers then and later included carrying and trading among his activities. At almost any point on the shores of the Bay of Quinte, from where the Murray Canal was eventually to have its entrance down to the outlet by Adolphus Reach to Lake Ontario, Myers would collect and deliver merchandise and orders and, with his bateau, passengers as well. His normal practice was to go as far as Kingston, charging for the freight the one way that it was taken, and to provide an accompanying settler with free passage back to his home area. The bateau, a flat-bottomed boat about 30 feet in length and with tapered ends was, although both durable and safe neither rapid nor the most spacious form of cargo and passenger craft afloat, and in time Myers obtained a schooner to continue a profitable occupation that sometimes took him as far as Montreal.

At the turn of the century Myers built other mills in the region outside the immediate area of the Trent, in neighbouring counties. Then, in 1806, he raised first a saw and then a grist mill at a distance of a mile or so from the mouth of the Trent, anticipating and eventually facilitating the growth of settlement there.

The problem of moving people westwards had, given the physical nature of the land, been a very real one from the beginning. Captain Myer's bateau made a difference and occasionally there was the possibility of conveyance with a Montreal or Kingston merchant, or even an Albany pedlar, whose bateaux and canoes every now and again made their way into the bay to collect packs of furs from Indians and to trade with settlers and squatters when and where the opportunity presented itself.

From the early 1790's, however, there was a need for a more regular and reliable means of communication beyond the head of the bay, especially after York (Toronto) became the provincial capital in 1794. With a sizeable trade in making in both directions, Asa Weller, who had opened a tavern by the Carrying Place, built a wharf and frame storehouse and provided both wheels (on a form of low-slung cart) and oxen for hauling the weekly bateaux with goods and passengers from and to Kingston and York over the few miles between Young Cove and the head of the bay, following basically the line of the old Indian portage.

The alternative for those coming from the east was to take a horse from Henry Finkle's in Ernestown (Bath) not far from Kingston and follow the route — "little better than a common Indian path, with all its windings" to Colonel or "Old Squire" Bleeker's (sometimes spelled Bleecker) property on the west side of the mouth of the Trent. Bleeker, who was said to be the first settler between the Carrying Place and the Trent, acted as Indian agent and was reputed to have "control of all the Mississauga Indians", to be "a man of considerable authority among them", and to therefore "command..... the entire country" from the Trent to where York and then Toronto were to be established. Consequently the traveller was able to obtain from him an Indian guide as well as a fresh horse, both virtual necessities when proceeding any considerable distance into the unsurveyed wilderness beyond Bleeker's.

When there was no choice at all, it was possible to walk from places east by the Lake Ontario shore, but the lack of a proper road or path made this a miserable undertaking at the best of seasons. In an effort to ameliorate the situation generally, the provincial government in 1793 passed an act designed to improve "the Laying out, Amending, and Keeping in Repair, the Public Highways and Roads", which required roads to be between 30 and 60 feet wide and made settlers responsible for clearing and maintaining sections adjacent to their properties.

The act made little real difference, as crown and clergy reserves remained unaffected and settlers preferred their roads to follow lines suitably adjusted to such natural features as hills, swamps and streams. The government, reluctant to become involved in road-financing, had however to make allowance for communciations between the few provincial centres, and by the end of the century Asa Danforth was able to complete his famous road that linked Montreal, York and Niagara by way of Kingston. The road, 40 feet wide, entered the Trent area at the Carrying Place from Prince Edward County and continued westwards along the lakeshore.

In the first years of the new century the Bleeker family, now comparatively isolated, introduced a ferry service across the Trent near to its mouth, which had the effect of diverting the main road through Sidney from and to Murray and the north shore of the Bay of Quinte instead of through Prince Edward County.

Ferries continued the connection for many years until eventually in 1834 "the best bridge in Upper Canada", as it was properly known, was constructed 750 feet long and 32 wide to provide continuous passage across the Trent.

Then, too, as wilderness gave way to settlement, there were the successors to such Indian traders as Rousseau and McLean. Often combining the old with the new trade almost despite themselves, they helped provide the cohesion that made communities of the settlements. John Ferguson and William Bell, for example, built a store not far eastwards from the Trent as early as 1789, and by the next year Ferguson — who handled the Kingston end of the joint undertaking while Bell remained in the wilds — found cause to berate his partner for forgetting that they were engaged in commerce, which meant dealing primarily with Indians who had furs to exchange rather than with impoverished settlers. "As to again taking up goods for trade", he wrote, "had I money I would not think it worthwhile. Notwithstanding all I said and begged of you, you nevertheless have let the white people have almost everything we had. When do you think they will pay for it?" he concluded half in admonishment, half in question.

Bell seems to have been too easy-going for their joint good, for Ferguson later warned him to "oblige every one to pay you in wheat, or otherwise I will want bread before winter is over". If, in settlement of their debts, they would "not take 3s. 9d. for wheat", Bell should make the settlers "pay in money immediately", failing which he should "send me down their accounts, and I'll summon every one of them". In the meantime, Bell was to "not spare a potatoe to any one soul. . .[and to] spare no salt to any one, as none is to be had here (Kingston), but at a very dear rate". Ferguson's tribulations had been compounded by the fact that the Mississaugas had already received a supply of cloth "which will spoil the trade this season, as after this the Indians cannot want clothing until the spring", but he hoped to salvage something by getting his hands on a supply of rum, without which for the time being "nothing can be had".

The following year, 1791, Ferguson himself moved to Sidney, leaving Bell in charge at Kingston, and his ground view of operations seems to have left him with the impression that the future might after all be best served by catering to the settlers rather than concentrating on the Indians. In an apparent first reference to apple trees in the Trent region, he wrote to Bell in July that a supply of saplings should be included in the next shipment of goods from Kingston, as there was a demand for them among the settlers.

Perhaps more opportunistic were the itinerant pedlars from the States who, often with their capital tied up in such merchandise as household wares that they carried around the bay, were in a position to take immediate advantage of, for instance, a possibility of securing land titles in return for debts, or to forsee commercial benefits to be gained from particular areas and commodities. Shortly after settlement began along the Bay of Quinte, one such pedlar, Asa Wallbridge, made a base for himself a short distance to the east of the future site of Trenton and transported numbers of fruit saplings and seeds from the States which he sold throughout the region, apparently planting his surplus in forest clearings rather than have it go to waste.

As government support for accredited settlers ceased by 1789, few of those within the area of today's Lower Trent Region received free supplies of seed, tools and implements, and conditions for land grants became more stringent

during the decade that followed. By 1800 in fact, Sidney township had increased its population so rapidly that according to the reminiscence of a settler in the 1860's land sold there at the equivalent of $1 an acre. With the Trent still then forming a barrier, the spill over into Murray, Brighton, Cramahe and Haldimand townships along the front of Lake Ontario took time. Beyond Murray, which was thought not to have the best agricultural land and anyway had a number of settlers as already mentioned, the next attractive mill sites were found on Brighton Creek and these were taken up from 1802.

Joseph (occasionally known as James) Keeler made what was probably his first journey to the future site of Colborne as early as 1789, but seven years passed before he brought in families of settlers to help him establish communities in both Cramahe and neighbouring Haldimand. Despite Seth Watkins' surveying work of the previous year, much then remained to be done, as Keeler explained in a letter of June 21, 1796 to Lieutenant Governor John Graves Simcoe, who, in turn, had positively encouraged increased immigration and settlement.

"I have", wrote Keeler, "this day arrived on [sic.] Cramhae [sic.] with a number of hands to begin the settlement of Holderman [sic.] and Cramhae", along with a surveyor and his assistants "to run the subdivision lines of said towns". But as other persons who were to have helped with the surveying were sick, "they have employed me to see to the surveying of Holderman" [sic.], which would help forward the project that had already been delayed by Keeler's own own bout of "Ague and fever... earlier in the spring".

Once the work was done, Keeler himself took the first and second lots in the two front concessions, including the area that was to become Lakeport. In October of the year, the surveyor's report showed 34 other family heads settled in the immediate vicinity, such later stalwarts of the community as Asa Burnham, Aaron Greeley and Christopher Hagerman among them.

Doubtless the changes in land tenure, flowing directly from the Constitutional Act of 1791 that split the old province of Quebec into two parts, helped to ensure this westward movement of people. Prior to that year the land grants had been technically made under a system of seigneurial tenure inherited from the old French régime. Under the new arrangements, all lands were "granted in free and common soccage as in that part of Great Britain called England". For five years nevertheless there was virtual administrative chaos in the holding, buying, selling, exchanging, and inheriting of land, and the status of land warrants and certificates of location was held in doubt by even so responsible a person as William Dummer Powell, who had much to do with government schemes for settlement.

> "It appeared", he wrote in 1796, "as was suspected, that the deed was a nullity, and that the colony had no security for its labours but the discretion of the Governor in Council, as the certificates vested no estate; and that a property of more than half a million was utterly afloat, without any legal assurance that it would be subject to the disposition of those who had created it."

Before the end of the year the inconsistencies were removed by a series of measures that clarified matters relating to land fees and legal ownership of land, and consequently confirmed the settler in his improvements to a more

meaningful extent than had previously been the case. Most of the newcomers, like the original loyalists before them, came from the United States, some of them attracted by Governor Simcoe's offers of land and others by family ties. A common practice was to settle initially at some place farther down the Lake and the St. Lawrence, to sell the improved land and to obtain perhaps more and better land in the new townships west of the Trent. There were few arrivals from the British Isles. Until the second decade of the nineteenth century what little emigration from there existed was largely confined to Scotland and was in the face of official discouragement.

By 1803, when the first annual returns were made for the District of Newcastle, the communities were shown to be small but comparatively well advanced agriculturally. In Murray there were then 103 persons, including 55 adults. Cramahe had a population of 314, with 126 of them adults, while Haldimand, with a practically similar total of 312 was, for the time being, better off with 160 adults. Percy's total population was 127, and only 44 of these were adults, composed of exactly equal numbers of men and women.

In the Newcastle District as a whole, which included three more townships along the Lake Ontario front but outside the Lower Trent boundaries of today, there were nearly 3,750 acres of cultivated land, valued in rateable property terms at something under $5 an acre; 100 horses of three years or more, valued at an average equivalent of about $37 each; 308 oxen, at just under $20 each; 514 milch cows, at a little less than $14 each; 252 "Young horned cattle", at approximately $5 each; and 231 pigs, each worth slightly over $2. At that time too there were listed in the district "2-1/2" grist mills having one pair of stones apiece, and "6-1/6" saw mills. Of the houses in the townships in 1803, some 21 had two fireplaces, the sign of a comfortable dwelling. Two taverns served the inhabitants' leisure hours, and 280 "gallons in Stills" of spirits were officially recorded.

Community spirit manifested itself in other ways as the wilderness receded. Even the merchants and Albany pedlars no longer came and went as they pleased. John Bleeker, Joseph Keeler and Asa Burnham were members of a panel of justices of the peace that, for instance, at the general quarter sessions in Murray township in October 1803 found a person named Bass Chard guilty of having brought "one four handed Bateau and six Barrels of salt... from the United States of America...[which] had not been entered at either of His Majesty's Customs Houses in this Province", and consequently ordered his vessel and goods seized while on its way up the River Trent and sold at public auction.

Chapter 3
DEVELOPING AGRICULTURE

The majority of the actual inhabitants of the new communities were, naturally enough, primarily concerned with turning their lands to agricultural uses. Many of the first of them were already familiar with North American techniques and native domesticated plants as well as other food sources and, as contemporary accounts tell, helped those who were not, as did the Indians who, long after the need of the moment was past, were in the habit of returning at least annually with maple sugar which they carried in basswood bags to trade.

In time the settlers themselves took to making maple syrup and sugar in quantities that made something of a festivity of the practice. An average production was said to be one pound of sugar for every forty of sap. As well, the wild rice that grew in abundance at Rice Lake, and at other places between there and the Bay of Quinte, was a useful supplement to the grains grown by the settlers. Generally it was brought for barter by the Mississaugas, who were adept at harvesting it into canoes by breaking the heads using twigs or small sticks. The settlers usually ate wild rice boiled together with meat.

Clearing and sowing wheat were, however, the settlers' main preoccupations. The trees that stood in profusion nearly everywhere were consequently obstacles to be overcome and the opinion was practically universal that, as one observer put it in 1795, "every cultivated patch of ground is to be regarded as a trophy of [man's] triumph over the desert".

Not that trees were by any means thought of as useless. They helped, first of all, to point out which were potentially good agricultural lands and which, by the same token, there would be little point in bothering further with. Beech for example, as already noted, was on its own the indicator of a light soil. Other trees also had a story to tell. As restated by 'Tiger' Dunlop, later known for his part in settlement schemes in the western part of the province, pioneer lore had it that a "mixture of maple, bass-wood (a kind of lime), elm and cherry, indicates the very best soils".

Pine, as was well-known, revealed "sandy soil, as often does oak, and always chestnut", and cedar and larch were plain warnings of swampy areas which, if drained, would only become "a bed of sand". Hemlock promised no better with its affinity for "wet clayey grounds by river sides" which, as other observers agreed, with pine and cedar lands were "hardly worth accepting as a present".

Once his basic maple, basswood, and elm had helped to narrow his selection of suitable land, the would-be settler was advised to make his final choice by looking for "large, tall" trees with "broad-spread bushy top[s], the bark clean and without moss" and with no obviously visible roots. A "large species of nettle taller than yourself" growing among the trees was thought to be a sure sign of "a rich deep inexhaustible soil - where, if you sow wheat the first year,

unless you eat it down with your stock in spring, you will have a crop of straw, but if you adopt the ... precaution, you may count on a return of from thirty to forty bushels per acre".

Otherwise it was oak, elm and ash together that was generally considered "excellent wheat-land, but inferior for all other agricultural purposes."

The choice of site made, the quickest way then to dispose of the trees was to cut them down with a four to six pound woodsman's axe (and not the short axe initially distributed by the authorities to pioneer families) and to pile and burn what could be conveniently dragged and carried away. Theory even suggested for a good many years that burning was doubly beneficial, as besides ridding the land of trees it added to its fertility - "the blacker the land is burned, the better the wheat crop".

The alternative, a slow process, was to girdle the trees by cutting a line in the bark and causing the tree to rot from there upwards. The stumps in either case were a nuisance but, if left alone, they rotted away in five years or so unless they were pine and hemlock stumps whose durability could be made to serve a purpose by dragging them out of the ground and using them as fencing.

There were as well, needless to say, many uses for sound wood. Cedar, for instance, was equally prized with hemlock for durability and both were used when hard-wearing qualities were a necessity, for example in making simple harrows formed in the shape of an 'A' and strengthened with iron overlay. And a good portion of pine, basswood, elm and cedar could be put aside for building a log shanty and perhaps shortly afterwards a frame dwelling that, contrary to popular legend, was not uncommon even before 1800.

Pine and basswood round logs, usually seven to twenty feet in length and notched at the ends were most frequently used for walls, and basswood could again be used for roofs, with elm bark and split cedar as other choices. A whip-saw was a useful, if not overly common, tool for making boards for doors and furniture. Elm and basswood bark also served to fashion harnesses for horses and oxen. After peeling the bark off the trees in spring and soaking it in water for weeks or months, the fibre could be separated from the rind and twisted into a fairly strong rope that was then shaped as required.

Oak and maple were found to be the best woods for making the 'Hominy Blocks', or mortars that, particularly in the early times, when grist mills were few and far between, were used for crushing grain. A block of about four feet high and two to three in diameter was cut from a tree trunk and a cavity formed in the centre for holding the grain, perhaps only a few quarts or perhaps a bushel or so, which was pounded with a six to eight feet length of wood capable of being gripped at one end and measuring a half to one foot in diameter at the other. The 'Hominy Block' was generally unsatisfactory for crushing wheat, but it served its purpose adequately with corn and wild rice.

However, as distances between collection points diminished with increasing settlement, the burning of wood, far from being a necessary chore, became a profitable occupation. The ashes of such hardwoods as beech, maple, elm, birch, poplar and oak were in commercial demand as early as the 1780's for the manufacture of potash, which was shipped to England. So great was the volume

The dam at Campbellford, 1913.

during the first years of the nineteenth century that potash was for a while Canada's leading export and, used in the manufacture of explosives, has been reliably estimated to have greatly helped Britain's maintenance of the balance of power in Europe during the Napoleonic years.

Price necessarily depended on such factors as quality, current demand and locality, but potash generally sold for from $60 to $70 per thousand pounds weight which, in turn, represented about four acres of forest. At times during the European wars of the first one and a half decades of the 19th century and restrictive American trade regulations of 1808-10, it went as high as about $300 a ton, but that was exceptional. As a settler with family was usually supposed to clear about 50 acres of land - a good average was about an acre cut in two weeks - it is clear that on the basis of volume it was only the merchants who made much from the local collection of potash. What the settler obtained nevertheless made a handy supplement, as most of them usually lived at best from hand to mouth.

There were, too, other uses for potash. A certain amount was required for domestic use. By constructing a wooden leach of perhaps six feet in height and tapering toward the bottom, and pouring into it a mixture of ashes and water, the settler obtained a solution which, when boiled, produced potash, and, with the addition of pork fat or rind during the boiling, as well as sometimes salt and resin, a hard or soft soap according to requirement.

Pearl or white quality ashes could be obtained by calcining with lime to produce potassium carbonate and, as refined potash, these were in greatest demand commercially. They were also common ingredients in the manufacture of such other articles as dyes and glass. In fact, so commercially important did potash rapidly become that, as early as 1801, an Act was passed to appoint inspectors of "pot and pearl ashes" to ensure as far as possible a uniform standard for the Canadian product in foreign markets.

With his land cleared and a shelter of some sort put up, the settler's first priority was to grow wheat. During the early decades of settlement no other crop equalled it in importance. The practice was to use minimum cultivation at first and then to plough the land "after it has produced 3 or 4 crops, but not very deep", as the well-known French writer and traveller Rochefoucault remarked in 1795 when passing through "Quinté Bay". Yet as much as 20 to 30 bushels an acre was not uncommon from an initial harvest, and district, "said to be cultivated up to a considerable extent", was then able to export "yearly about 3 or 4, 000 bushels".

Peas and oats were customarily the second and third choices as crops, and corn, barley, clover, timothy hay, turnips, potatoes, and even pumpkins all had their place, especially in the early 1800's, but including some years in the 1790's when the Hessian fly and smut made disasters of wheat.

Despite, or perhaps because of primitive conditions that invited diversity of agricultural talent, there was general agreement on the most suitable methods of cultivation and advice was freely given and printed. One of those who claimed to describe matters as they were in the first quarter of the nineteenth century was Joseph Pickering, who farmed in several places after immigrating from Britain. For breaking up fresh ground, he recorded, two yoke of oxen to a plough

were thought necessary but one yoke was found sufficient for normal use. Some ploughing could, of course, be done in the fall and the land sown to spring wheat and perhaps timothy and clover, and harrowed from early April, conditions permitting. Peas were put in the ground in the days that followed, Pickering himself preferring 2-1/2 bushels of seed to the acre, but "many people sow much less". In later weeks there were more additions of timothy and clover, and up to three bushels of oats to the acre were sown. By the end of May, ploughing for corn could be done. For those to whom corn was a strange crop, Pickering provided further details.

> After "ploughing and well harrowing", he wrote, "... parallel furrows are run by the plough three or four feet asunder, straight across the field, and sometimes intersected; when the planter, with a little bag of corn before him, ... and a hoe, proceeds along these furrows, and drops, at from one to three to four feet apart, two, three, or four grains of the corn in one place, and slightly covers them with the hoe; some prefer planting in the furrows, others between them, according to the dryness of the soil, or the season. The quantity of seed required is only about one peck per acre; corn is sometimes planted on the furrow ... of new ploughed grass land, and does very well"

provided that the frost did not get it first.

Planting potatoes was a task best left into June to finish. Three or four of the cuttings were dropped "together in one place, then the soil hoed over them into a 'hill' 2-1/2 feet apart each way".

This method, used on freshly cleared land when there were still stumps in the ground, was continued for years afterwards when, as Pickering thought, there was no "necessity for it, which I think an injudicious practice".

Late summer meant first and foremost the wheat harvest. The best of the crop was flail-threshed and a good part of it reserved for "flour for the merchant" with the remainder being set aside for family baking. Eight to fifteen bushels a day could be had from this method, a hired thresher often obtaining one-twelfth (one-tenth prior to an act of 1692 that regulated the toll and remained in effect until 1867) when the grain was taken for bolting and grinding. The poorer quality, or what could not be otherwise handled, was trodden out with oxen or horses, one man with a team of four being able to produce 30 bushels or so a day of dirtied grain which the merchant might not accept but which "does very well... in the distillery". Particularly after 1800, there was nearly always ready cash to be had from selling grain either directly to the distilleries or taking back one's whisky and using it as a liquid resource in more ways than one.

It was hardly by chance, or because of the traditional desire of farmers to be involved in wheat growing rather than more mundane forms of farming, that wheat became virtually a universal currency. Richard Cartwright who, working

out of Kingston, was probably the province's leading merchant of the time, put down one point of view in October, 1792, when he wrote that: "As long as the British Government shall think proper to hire people to come over to eat our flour, we shall go on very well, and continue to make a profit." It was the garrisons that made the difference for, to be sure of feeding them, government had in effect to subsidize the price, paying cash according to a stable market at Montreal. The next year, 1793, Cartwright wrote that there was no debating the fact that "Wheat and Flour are now becoming staples Articles with us and unless we can make our payments by their means our business is likely to become very Languid".

It was standard practice, as Rochefoucault again noted in 1795, for settlers to wait until the ice was on the rivers and Lake Ontario before taking their grain by sleigh to merchants to whom it was often already owed or promised, a journey that took many as far as Kingston. Others preferred rafts or bateaux when available. The merchants, for their part, "engage, on the arrival of the ships from Europe, to pay the[grain's] amount in such merchandise as the sellers may require", and in turn sold to government agents who had large amounts ground into flour and forwarded "to the different parts in Upper Canada, where it is wanted". The surplus was shipped to Montreal and Quebec, and eventually to Britain.

In the year of Rochefoucault's reporting, flour sold at Kingston at $6 a barrel (about $1 a bushel to the settler was average). Half a decade previously, over 6,000 bushels of wheat had been sent to Kingston from areas that included the Bay of Quinte, and the previous year, 1794, some 1,624 bushels of wheat and 3,596 barrels of flour had been sent to the three major garrisons in the province. For shipping to Montreal and eventually abroad there had been a large surplus of 12,823 bushels of wheat, 896 barrels of flour and 83 barrels of biscuit flour.

Because of infestation by the Hessian fly, figures for 1795 were not comparable, but by 1797 surpluses were again the rule and Canadian flour found outlets in American markets, from Ogdensburg southwards, as well. From 1800, boat loads of principally flour, grain and potash leaving Kingston for Montreal numbered in the hundreds annually. Most vessels - increasingly Durham boats measuring perhaps 60 by 12 feet replaced bateaux - were capable of carrying 200 barrels or so of flour and the largest, like Thomas Clark's 'river boat' that made its maiden voyage in 1801, up to 350.

With the population of the whole province being probably no more than 75,000 up to the end of the first decade of the nineteenth century (although some earlier, now generally considered to have been optimistically exaggerated, estimates were nearly double this amount), some idea can be had from the above figures of the large per capita wheat production of the area that included the Bay of Quinte and had Kingston as its market centre.

Profits from livestock were more by circumstance than design until approximately the 1820's. Most of what was brought into the settlement areas from the 1790's was intended for the use of settlers themselves and not for sale or profit, but some was nevertheless to be had from pigs so long as the army continued to favour salted pork. Those kept by the settlers were nondescript by any standard and generally ran semi-wild in the woods until the snow was permanently

on the ground, after which they were fed scraps such as potato peelings and sometimes buttermilk, and even peas or corn when the time was near for slaughtering.

However, the classic economic hog cycle, despite minimum cost per animal, made anything like specialization risky at best, as demand one year for pork might be either halved or doubled the following year, and the salt used in curing added an extra twist as the cheapest, Onondaga Salt, turned meat blue which made it offensive to some tastes or even unacceptable.

Cartwright, nonetheless, was able to have cured as much as "480 Barrels of Pork for the use of the troops" in 1793-94, and "thought double the Quantity may be furnished this year" (1794-95). Rochefoucault, in 1795, reported as many as 1,000 barrels of salt pork for sale in the Kingston market and by 1800 Cartwright could promise delivery, given six months notice, of more than 30,000 pounds weight, packed in more than 200 barrels. Just over a year later the possibilities for local salted pork seemed so good that he took steps to extend his distribution network to Newfoundland.

The first horses that the settlers had were a small breed developed over a number of generations in French Canada. Known variously as "Normans" and "French-Canadians", they were so suited to farm work that they were bred rapidly and later came to be known as "the basis of the general horse" in the upper province. Robert Jones, in his "History of Agriculture in Ontario", afterwards quoted a known agricultural authority of the nineteenth century, William Evans, to the effect that: "the 'Canadian horse' [i.e. the "French Canadian"] ... when of sufficient size, cannot be excelled for agricultural purposes by any horse we have ever seen on this continent."

With the closeness of the United States, there was considerable trading back and forth from the end of the eighteenth century onwards, and many American mongrel strains were brought into the province and crossed with the French Canadian. These strains served settlers for years for general as well as farm work but, with the course of time and a taste for something other than utility alone, near and genuine purebreds such as the Morgan (with, paradoxically enough, "Norman" ancestry by all evidence) were imported from across the border and from the British Isles to be used for show and perhaps for travelling. Later imports included such heavy draft horses as Clydesdales and Shires.

Cows and oxen, too, were brought in from French Canada by pioneers who cared little about purity of breed and far more about the working qualities of cattle which were kept as much for hauling as for providing milk and meat. A farmer might have a half dozen or more of them, of assorted shades but with black and red predominating, of uncertain ancestry but more probably related to Jerseys and Guernseys than any other, and even of varied size within the limits of general smallness.

As likely as not they were left to forage for themselves during most of the year and to be stabled, or merely sheltered, and fed hay only in severe conditions of winter. Other larger, mixed breeds were brought from the States, usually from New York, and though assessed by Rochefoucault in 1795, as a result of his enquiries, as "finer" than the Lower Canadian, and costing $20 a head as opposed to $15, the latter were admitted to be "in the opinion of the

farmers better milch cows and are, for this reason, preferred". The "generality of farmers", thought Rochefoucault, "are not sensible of the advantages to be derived from cattle of a fine breed".

Nevertheless, prior even to 1800, quantities of Ayrshire cattle began to arrive in the province from Scotland. They were, initially, in the way of being indirect imports as they were brought over on immigrant ships to provide milk for the passage and happened to be disposed of by sale in Quebec and Montreal from where they were eventually taken westwards. Their value accepted, numbers of them were imported directly, as in later years were various grades of Devons and Durhams, the latter in its Shorthorn breed being regarded from about 1850 as the best all-purpose species of cattle. Still later Herefords followed.

Milk yields increased accordingly. Robert Gourlay, just after the War of 1812, noted that "A cow will give (including summer and winter) in the course of one week 21 quarts of milk, which will make three lbs. and a half of butter, or four lbs. of cheese." By mid-century, with the improved strains, yield per cow was in the region of twice this amount, or approximately half that of a twentieth-century animal.

Sheep were kept in fairly large numbers from the 1790's. With their hardiness they could be counted on to involve the settler in negligible cost, but were described at the time as "high-legged and of a very indifferent shape". Despite reportedly being frequently preyed on by wolves and other wild animals, their chief virtue was that they "thrive in this country". An average clipping yielded three to four pounds of coarse wool with a saleable value that averaged for years about 50¢ a pound, which certainly compared well with the cost of an entire sheep of three dollars or so. For long periods, however, markets for wool were small or non-existent, and most farm families kept no more than five or six sheep for their own clothing needs, although 20 to 30 were recorded as not uncommon and 50 to 60 were rare but known.

In the 1820's a few Leicesters were introduced, followed by Cotswolds and, as small woollen factories were established, by Merinos and Saxons in the 1830's.

Finally, of course, each farm clearing had its complement of hens, ducks, geese or turkeys.

The small communities in the Lower Trent region were either still in their first or barely into their second generation when the War of 1812 came along. Within the decade that followed, nevertheless, they became known as part of the 'old settled' area of the province. The Governor and his administration in Canada, and therefore the Colonial Office in London, were convinced once the war was over that "the danger in which Canada was during the last war had arisen from its scanty population", and that fresh stock had to be taken of its "already being too much inhabited by Aliens from the United States".

Both problems, it was self-evident, could be solved by increasing British immigration and stopping American. In London, emigration was still frowned upon as permitting the often more capable and adventurous of the population to be lost to the state, and the colonial authorities felt obliged to explain that "the object of the [British] government was merely to direct those determined to

emigrate and change their destination from the United States to His Majesty's possessions". With the banishment of Napoleon and an end to the European wars, resulting mass unemployment, low wages, widespread poverty conditions and general depression from 1815, emigration became officially respectable and, as the responsible minister later wrote to the Governor, it was found "politic" to assist selected immigrants to Canada.

For one reason or another financial support for would-be settlers was on an on-again-off-again basis during the decade that followed, while at the same time there were fewer obstacles in the way of persons willing to make their own way. A mere 680 arrived from Britain in 1815, but four years later there was a substantial increase to 23,534 which, however, remained the high until 1830 when there were more than 30,000 immigrants. From that time on, with the exception of the years 1835, 1838-39, the second half of the 1850's and those just prior to Confederation, the movement, if not a flood, was substantial, with the record number in a year being 109,680 in 1847. Immigrants from Europe were, during the early years, few and far between, but twice in the 1850's they numbered over 11,000 in a single year.

The 'old settled parts' of the province was, therefore, even by the 1820's, an apt description for much of the Lake Ontario front. Many of the immigrants automatically passed on to places west, including the States. As early as 1817 Kingston, the urban centre for the region that included the Lower Trent, established a "Compassionate Society" to "furnish information" to newcomers and find employment for them in order to prevent their "discomfort and departure".

By the early 1830's the futility of the attempt was admitted by the Kingston Spectator. Immigrants, it complained, "shun the eastern parts of the Province as they would shun a pestilence, and flock in crowds to the more westerly districts". In 1834 some 30,935 persons arrived in upper and lower Canada, but only 1,000 chose the Kingston and Bay of Quinte vicinity as their immediate destination. Price and availability of land as well as visions of an unsullied frontier doubtless had much to do with it all, for lands in the 'old settled parts' were expensive and the style of farming set.

Even in the back range of townships, Huntingdon, Rawdon, Seymour, Percy and Alnwick which, during the first decades of settlement along the Lake Ontario front, had been considered somewhat backward agriculturally, were in varying degrees put to the plough and turned to wheat and other crops, though the sandy rear of Haldimand and part of that of Cramahe were still avoided, as were the 'oak plains' in the rear of Murray, a 'Front' township.

Between 1826 and 1830 a few hundred Mississaugas, who had previously wandered the Bay of Quinte, were settled by government on 2,000 acres in Alnwick. Richard Birdsall, who surveyed the territory in 1826, found it swampy with the odd good lot and an abundance of "scrub oak" and stony ground where the land was open. With initial outside assistance, a village or long main street, Aldersville, was set up and the land cultivated in lots of 25 acres. By the mid-1840's there were 22 frame houses and 14 log cabins, "all of commodious size", six barns and a sawmill. Nearly 400 acres were then under cultivation, and stock included eight yoke of oxen, 11 cows, and 21 heifers and calves.

Seymour township, practically without inhabitants up to that time, was settled by retired naval and army officers from 1832-3. Samuel Wilmot, who surveyed the area in 1832, noted that A. H. Meyers (more frequently then known as Myers) had a sawmill, framed house, barn, and outhouses on lot four of the second concession, that Samuel Dank, George Clute and Hezekiah Herd also had lots in the second concession, that "Meyers" (Myers) again, William Loake, William Twick, Andrew Althouse, and William Thrasher were on land in the third concession, that James and Samuel Hubble were the only occupants in the fourth concession, and finally, that R. Baker "& Brother", R. C. Wilkins and Andrew Emery were spaced at intervals in the fifth concession. Wilkins also operated a sawmill at the lower falls on the Trent.

The timber, already cut over by Myers and others ("good Lumber roads" were noted by Wilmot), was much the same as in the neighbouring townships except that there was probably more pine and oak which still stood in considerable quantities, particularly in thin and sandy soils in the second, fourth, and fifth concessions. Otherwise, with some sandy loam, and a fair proportion of good land by Wilmot's estimation in all concessions but the fifth - where the Baker brothers had what little there was - the usual maple, ironwood, poplar (aspen), basswood, ash, elm, birch, beech, and cedar were found in varying amounts. Areas of thick underwood, fallen or windblown timber, and the occasional burnt over stretch, completed the general description.

The government agent, a Major Campbell, had no trouble in immediately and successfully establishing his officer settlers: within the decade there were 1899 inhabitants on farms that were admired for long distances around for their "flourishing" state. The Major left his name to the village which eventually straddled the Trent River between its confluence with the Crowe and Percy Reach. As Campbellford the village was incorporated in 1876 and received town status in 1906.

The township retained its first reputation and maintained a steady growth up to the period after Confederation when there was an exodus from all parts of the province to the western prairies, first the American and afterwards the Canadian. By 1842, 6323 acres out of a total of 31,850 allotted in Seymour were under cultivation, and there was regular employment for two grist mills and six sawmills.

Two years later a bridge was constructed across the river at Campbellford (then Seymour Bridge) to replace a ferry, and guide booms were added for good measure. In the final year of the decade, 39,000 bushels of wheat, 6,000 of oats 5,800 of peas, 28,000 of potatoes, and 1,000 of turnips were produced from an arable area that had been increased by nearly 2,000 acres over the earlier figure. As well, the township's farms manufactured a total of 4,700 pounds of butter and 3,000 of cheese. An extra grist mill, too, was required before mid-century.

Percy Boom, originally Beatty's Landing after the boat-keeper there and later Percy Landing, was the other centre for retired officers who were attracted by the mill sites and, as Sir Richard Bonnycastle wrote in the 1840's they carved "a surprising new settlement in the Bush ... and a thriving new population is rising both in numbers and in means".

Percy Township, although with a head start on Seymour, developed at a somewhat slower pace. By 1842 its population was, at 920, half that of its neighbour and out of 21,264 acres assigned to different persons 4,303 were cultivated. At mid-century 2,162 persons lived in the Township and 29,000 bushels of wheat, 14,900 of oats, 9,900 of peas and 24,000 of potatoes were obtained from 5,533 acres. Its centre was Percy Mills, which had the only grist mill, and one of the five sawmills in the township. Its growth from that time was comparable to that of Seymour and was likewise affected by the post-Confederation movement of people westwards.

Rawdon, with a considerable amount of swamp land, had in 1842 a population of 1,310 - compared to 300 by Gourlay's count in 1819 - predominantly French-Canadian and Irish, on patches of what was described at the time as land "of excellent quality", but only one grist and one sawmill. In 1850, newcomers had doubled the population to 2,613 which produced in that year 37,000 bushels of wheat, 13,000 of oats, 11,000 of peas, 21,000 of potatoes and 5,000 of turnips.

With their longer settlement the front townships were naturally larger producers. Already in 1830, "The Commissioner of Inquiry Into the State of the North American Province" had committed to official memory that "From Cobourg to the Bay of Quinte the roads were good, the crops fair, the country well watered". Sidney had 3,552 inhabitants in 1850 who produced 58,000 bushels of wheat, 11,800 of rye, 27,000 of oats, 19,000 of peas, 7,000 of corn, 24,000 of potatoes and 25,000 pounds of butter and 15,000 of cheese. As the township had been settled for nearly 70 years many of the farms had, by then, as W. H. Smith (who went about the province collecting statistics and impressions) reported, had time to became "untidy" and "dilapidated" despite being "generally sufficiently extensive".

One step to the west, Murray Township had Trenton, largely developed from the 1830's as headquarters for the district lumber trade ("a sort of miniature Bytown", Smith described it), which tended to compensate for the poor quality of much of the soil. The township, which then included a sizeable portion of what became Brighton Township, had a population of 5,002 in 1850 and 13,332 acres under cultivation. The harvest that year included 58,000 bushels of wheat, 10,900 of rye, 23,000 of oats, 19,000 of peas, 10,000 of corn, 38,000 of potatoes, and 14,900 pounds of butter were made from the milk of local herds. Demonstrative of the township's primary interest was that it had fourteen saw and only two grist mills, the main one at Brighton with two run of stones. Brighton was then a community of 500 and also a port for the lumber trade.

Cramahe was also affected by the lumber trade, many of its settlers preferring to spend a long winter in the forest lumbering "shanties" to the detriment of their farming. 16,642 acres were cultivated in 1850, when the population was 4,389, and the year's crops were 44,000 bushels of wheat, 10,000 of rye, 34,000 of oats, 14,000 of peas, 12,000 of corn, 38,000 of potatoes and 9,800 of turnips. There were, as in Seymour, numerous sawmills, 19 in all, but only two grist mills. Colborne, like Brighton, was a small (600 inhabitants) forwarding and distribution centre which handled thousands of barrels of flour and as many square feet of pine lumber annually from the township and places beyond.

Haldimand, too, had 19 sawmills, but with four grist mills was better served for bolting and grinding. By 1850, when its population was 4,177, its

harvest, apart from an exceptional potato crop for the year of 93,000 bushels, was almost interchangeable in production totals with that of any of the other front townships, with 54,000 bushels of wheat, 9,000 of barley, 10,000 of rye, 42,000 of oats, 14,000 of peas, 13,000 of corn, and 25,000 of turnips.

Wheat, as the above figures show, continued to be the farmers' consuming interest. But this "everlasting wheating" as it has been graphically described, was not in point of fact to last forever.

Chapter 4
LATER AGRICULTURE

The market place for wheat had its ups and downs from the earliest days of the nineteenth century. 1802 was an exceptional year by any standard, during which 1,151,033 bushels of wheat and flour were sent down the St. Lawrence for export, but in the four years from 1813 to 1816 the annual totals did not even reach 10,000 bushels. The situation stabilized from 1817, when the amounts jumped to 335,895. Apart from 1819 and 1829, when the figures were 98,325 and 99,377 respectively, they remained between 300,000 and 500,000 bushels annually until 1830.

In that year, 948,826 bushels were sent for export, and a newspaper of the time commented that "UC Wheat has brought the highest prices the British markets would afford, and been spoken of by millers as a grain of superior quality." Transportation rates, too, decreased as the St. Lawrence forwarders anticipated the competitive effects of the Rideau Canal, and it seemed at the time that the prospects for wheat farming could be counted upon.

Other factors tended to confirm the impression. Red fall wheat had long been the favourite, and by the 1830's more careful cultivation and later sowing helped to check the Hessian fly, although the cure was sometimes no better than the affliction as it invited black-stem rust and winter-killing. The immediate Bay of Quinte area was one of the few in the province that was really suited to the growing the then current varieties of fall wheat. Westwards, as far as Cobourg and well inland, late sowing was said to result in winter kill as often as three times out of four over certain periods.

Farmers, however, turned more to spring sowing and other varieties of wheat, including such white wheats as the White Flint and, later, the Hutchinson or Kentucky White Bearded. Montreal merchants, according to the "Canadian Courant", quickly found the Upper Canadian white to be "really a beautiful grain".

Starting about 1830, Mediterranean or Italian wheat was imported from the States and, as a spring variety, became increasingly popular. Others, more particularly the Siberian and the Bald Club, followed within the decade.

From the 1830's as well, more thought was given to putting something back into the soil. Apart from livestock manure and sometimes ashes, there was gypsum - sometimes referred to as Plaster of Paris - which was used widely, if not extensively, by the Bay of Quinte farmers who obtained it from Oswego, which was accessible by water and therefore helped them to avoid the high transportation costs faced by inland farmers. Otherwise there were difficulties in acquiring the rock and having it pulverized: when this could not be done in mills, the arduous alternative was to use a hammer. Gypsum was applied to clover crops preparatory to the later planting of wheat.

Agricultural societies helped to make the new techniques better known. One of the first in the province was the Northumberland County Agricultural Society, which was initially set up in the late 1820's and re-organized after an Act of 1830 to encourage the establishment of such societies. During the same period a local society, known as the "Colborne and Cobourg" was established.

The societies showed improved seeds, and sometimes distributed them, and new implements that included local adaptations and refinements. As well, they arranged shows of horses, cattle, sheep and hogs and various types of produce and home-made articles. One of the first acts of the Northumberland County Society was to import Durham cattle from New York State in 1832 to improve local breeds.

The nature of such societies, however, tended eventually to confine interest to small groups of farmers. Successor organizations then grew up in certain localities. The proceedings of a number of them between 1852 and 1870 were closely recorded by the "Canadian Agriculturalist" and the "Canada Farmer", and his examination of them led Robert Jones, in his "History of Agriculture in Ontario", to the opinion that one club "much more interesting than most" was the Brighton and Cramahe Farmers' Club. In a typical year, subjects covered by the society included "preparing the soil for spring crops, bee-keeping, pigs and their management, 'the farmer's spare hours and how to use them', the dairy and its management, sheep and their management, and the improvement of Upper Canada agriculture".

Improvements in implements and cultivation methods, both through the efforts of agricultural societies and otherwise, also helped to emphasize wheat farming. In the 1840's the wooden and iron-lined ploughs of the type used by the first settlers were still in common use, although they had to some extent been replaced by copies of the American cast-iron plough and the Scottish "swing or wheelless" plough.

By 1850, combinations of the features of these, with additions, produced "an almost endless number of mongrels" which were generally improvements on the originals. "Almost every county", wrote the "Cultivator" in 1852, "and sometimes even township, has a plow in general use, embodying distinct features". Harrows were similarly improved and, towards 1850, "cultivators", "grabbers", and "scrabblers" became more widely used in working fallows.

The first reaper in the province was brought to Cobourg, just outside the present-day Lower Trent Authority, in 1843 from the United States and was rapidly being introduced into the area, followed by others of McCormick manufacture by the end of the decade.

During the 1850's, McCormick reapers in turn were displaced by Burral, Manny and other machines, also initially imports from the States, which in some cases had built-in grain rakers. Combined mowers and reapers - one claim was that a daily cut would exceed that of up to forty men with scythes - also became popular, as did from the early 1850's the simple Ketchum-style mower. Heavy cultivators, seed drills and gang ploughs were adopted at later intervals, and by the 1860's farming was fairly well mechanized.

Electric power house on the Trent River, some 60 years ago.

The problems inherent in wheat farming had less effect on the farmers along the Lake Ontario front than it did on those elsewhere in the province who were prepared to turn to other forms of agriculture. The first serious and continuing crisis during this period was the result of the British adoption of the principle of free trade. Although the country as a whole considered the policy anything but beneficial, wheat farmers were assured by a British sliding tariff of 1842 of a market for their produce and, from exports of a few hundred thousands of bushels of wheat and flour annually by the St. Lawrence in the 1830's, the flow increased in the 1840's to amounts that far exceeded a million, and then two million bushels a year.

There were complicating factors, having to do with the import and re-export of American grain, but the net effect was, as the census publication of 1851-52 pointed out, to increase the Upper Canadian wheat crops by 400 per cent between 1840 and 1850. With the repeal of the British corn laws in 1846 in a move to total free trade, the assured market for Canadian wheat and flour was lost and, although a modified tariff continued in force to the end of the decade, it was a matter of general agreement throughout the province that the outlook for farmers who persisted in growing wheat was grim.

Nevertheless throughout Northumberland County and adjoining districts the tradition persisted and, according to the census of 1851, more than half the acreage sown to grain crops was given over to wheat. An observer of the time (1852-53) remarked that "there is probably no country where there is so much wheat grown in proportion to the population and the area under cultivation as in that part of Canada west of Kingston".

As it happened, a market for Canadian wheat at higher prices than before opened up in the 1850's in the United States and, as well, the commercial flour mills that had been constructed on the Ottawa to provide for the needs of the lumbering industry took considerable quantities of Bay of Quinte wheat at prices ten to 15 per cent above average.

Of more concern, in fact, was the wheat midge which had been moving steadily westwards during the 1840's and reached the area about 1850. Those afflicted turned to other forms of farming to tide them over. Despite competition from American products, for instance, a market was found for domestically produced cheese and butter, and by the end of the 1850's Northumberland County's annual production of cheese was in excess of 100, 000 pounds (out of a provincial total of 2, 600, 000) and of butter in excess of 600, 000 pounds (out of a provincial total of 16, 000, 000).

American cattle buyers also entered the region in increasing numbers and, in spite of a heavy U. S. import duty, fattened cattle were a worthwhile sideline, and breeding grew accordingly. Horses, too, were in demand, though to a lesser extent, and from the mid-1850's American buyers arrived in search of Upper Canadian sheep, particularly Leicesters for both mutton and wool. American requirements for such coarse grains as oats, barley and rye increased at the same time, so that land normally given over to wheat did not have to go to waste.

There seems little doubt that there would have been a definite change to mixed farming if the European wars of the mid-1850's and the free trade agreement

with the United States at the same time had not encouraged the farmer to concentrate on wheat growing. With high prices and an enlarged market there was less point in taking into account the warnings of such persons as the presidents of the provincial Agricultural Association, one of whom in 1847 told an audience that "the productive powers of the soil ... (have) become so reduced, and the yield consequently so small, as to scarcely adequately remunerate the cultivator for the expense of harvesting". Another, in 1850 cautioned his listeners that "the farms on the whole line in the old Townships from Montreal to Hamilton, and round the banks of the lakes, rivers, and bays, for a space of eight or nine hundred miles, with a few exceptions, are, what is in Canada termed, worn out". In the first six years of the 1850's, prices for wheat quadrupled, but then in 1857 they fell by about one-third at the same time as the wheat midge made its presence felt again.

What made the greatest difference, however, was the American Civil War in the early 1860's. Contrary to expectations, the demand for wheat did not increase, as the new wheat-growing areas in the American mid-west provided all that was required. Instead, what the Americans did buy was horses, sheep, and cattle, at far greater prices than previously, and large amounts of oats and barley. Shortly before the termination of the war in 1865, a newspaper report noted that "oats and barley are the chief staples of a large portion of Upper Canada". Hop growing was also much encouraged by the U. S. war market, and Northumberland County became one of the chief Upper Canadian producers.

With the ending of the war and, the next year, the reciprocal free trade agreement with the U. S. , farmers had once more to adjust to new conditions. Hop production declined: in 1870, with the provincial total at 1,188,940 pounds, Northumberland County with 171,514 pounds was second only to Middlesex, which produced very little more. Ten years later provincial production had nearly halved and the Lower Trent region's portion of it was numbered only in tens of thousands of pounds. Soon after it ceased to be of any commercial importance.

Although wheat continued to be grown, it underwent a steady decline, particularly after the large-scale opening of western prairie lands and the extension of railway lines westwards after 1880. Barley became the staple crop along the whole Lake Ontario front and, in 1880, Northumberland was the fourth largest provincial producer, after neighbouring counties, with 811,606 bushels.

Excessive cropping rather than careful cultivation was, however, the rule. In 1873, for example, a Northumberland farmer was quoted in the "Canada Farmer" to the effect that "All of us can remember how some years ago, what with dry weather, and the midge, it was hardly possible to grow a crop of wheat worth harvesting; Then we took to raising barley as a substitute; and now, as a natural result, in many of our fields we can hardly tell which is master, barley, thistles or charlak".

Dairy farming was encouraged by the renewed duties on American products after 1866. Cheese factories immediately proliferated, particularly in the area from Belleville to Port Hope. Because of the poor quality of the product, many of them failed immediately, but in 1870 there were more than 300 in the province and nearly 600 ten years later. The introduction of tried techniques and machinery from Europe and the United States, especially the cream separator in the 1880's, rapidly helped to raise standards.

In 1867, the president of the American Dairymen's Association wrote after a tour of Ontario cheese factories that "I tried many cheeses in various factories, and found many of good quality; candor compels me to add that I also found many that were execrable". Just over ten years later, a Bay of Quinte factory owner stated a widely held view that "the dairying system has .. attained a high degree of excellence of late years", and by way of demonstration added that the "cheese made at our factory in 1866, and which then commanded the highest price, would now be regarded as a fifth or sixth rate article, if saleable at all".

Provincial dairymen's associations also helped to consolidate the advances made, although there were political differences between the two major producing areas — the "Belleville District" (as that which included the dairymen of the Lower Trent was popularly known) and the "Ingersoll District" of Oxford County — which resulted in a series of mergers and separations that started in 1872 and continued after 1900.

The establishment of a cheese board for the "Belleville District" in 1873 aided marketing, and the increasing use of refrigeration from about the same time made possible more extensive sales in British and American markets as well as domestic ones. In that year nearly half a million dollars worth of cheese was sent abroad from the "Belleville District".

Butter production in the area was relatively less significant from the 1870's, with much of it being taken, along with liquid milk, to such local urban markets as Trenton. Improvements in the quality of herds followed naturally from the emphasis on dairying, and new purebreds that included in time the Holstein-Friesian were obtained. All-purpose cattle, however, remained dominant, as they could be turned to beef when no longer profitable for milking, or even earlier when prices were high. As well, farmers had every reason to turn more land to pasture and to the growing of coarse grains and roots to feed stock.

With mixed farming established and the growth of urban markets vegetable and fruit growing also increased, particularly on lands directly back from the Lake Ontario front.

These forms of farming, together with tobacco cultivation during the past two decades, have remained important, and canning and cheese factories continue to operate in the Lower Trent region to-day.

Technological improvements, the lessened need for farm labourers, and the attractions of western farming areas and of towns and cities, however, have all contributed to the decline of the rural population. The decrease in Haldimand has been the largest in any of the townships. Between 1851 and 1861 its population grew from 4,634 to 6,164, but after Confederation it fell to 5,796 and then to 4,484 in 1891, 3,465 in 1911, 2,859 in 1931 and to 2,486 in 1951. By 1961 there was a slight increase to 2,803.

Cramahe's inhabitants went from 2,993 in 1851 to 3,833 in 1871, and then decreased to 2,995 in 1891, 2,373 in 1911, 2,224 in 1931, and 1,994 in 1951. By 1961 there was a slight rise to 2,124.

At the same time the village of Colborne at the township front increased its population from 806 in 1861 to 1,068 in 1891, 999 in 1911, 1,015 in 1931, 1,108 in 1951 and 1,336 in 1961.

Brighton township maintained a fairly stable population for thirty years from 1851, with 3,725 in that year, 3,734 in 1871, and 3,470 in 1881. By 1901 it was down to 2,774 and the decrease continued to 2,247 in 1921, 2,244 in 1931, and to 1,961 in 1941. In 1961, however, the number increased to 2,451.

Brighton village grew slowly from 1861, when the population was 1,182, by 100 to 200 persons a decade until the last years of the century and the early 1900's. With 1,378 in 1901, it then increased again to 1,411 in 1921, 1,651 in 1941, 1,967 in 1951, and 2,403 in 1961.

Murray over the century has had first a decrease and then an increase in recent decades, from 3,612 in 1861, to 3,560 in 1881, 2,993 in 1901, 2,536 in 1921, and 2,755 in 1941, 3,047 in 1951, and 4,558 in 1961.

As a regional centre for the surrounding townships, Trenton, apart from a small decline in the first decade of the present century, has had a steady population increase, from 1,398 in 1861, to 3,042 in 1881, 4,217 in 1901, and then 3,988 in 1911, and to 6,276 in 1931, 10,085 in 1951, and 13,183 in 1961.

Sidney's population declined after 1871, when it was 5,264, to 4,842 in 1881, 4,685 in 1891, 4,438 in 1901, 3,736 in 1921, and 3,627 in 1931. By 1941 it was up to 4,060 and, with the influence of Belleville, then rose rapidly to 8,416 in 1951 and to 11,397 in 1961.

Of the rear townships, Seymour had the largest population in 1861, of 3,842. By 1881 it declined to 3,783, and then to 3,261 in 1901, 2,687 in 1921, 2,549 in 1941, and 2,546 in 1961.

Percy, with 3,515 inhabitants in 1861, experienced a rise to 4,084 in 1871 and then a steady decline to 3,388 in 1891, 2,766 in 1911, 2,386 in 1931, 2,134 in 1951, and 2,090 in 1961.

Rawdon's decrease was similar but slower. From 3,591 in 1861, the population reached 3,688 by 1871 and then fell to 3,629 in 1891, 3,029 in 1911, 2,630 in 1931, 2,238 in 1951, and 2,151 in 1961.

Huntingdon's highest population was in 1861, when it was 2,917. By 1881 it dropped to 2,555 and, although there was a small increase to 2,612 in 1901, it lessened to 1,758 by 1921, 1,695 in 1941, and 1,508 in 1961.

Alnwick, from 1,388 in 1861, went to 1,471 in 1881 and then down to 1,247 in 1901, 696 in 1921 and, after a slight rise to 755 in 1931, to 641 in 1951, and 611 by 1961.

The inland village areas all grew in size, Campbellford from 1,418 in 1881 to 2,744 in 1931 and 3,478 in 1961, Frankford from 533 in 1891 to 852 in 1931 and 1,642 in 1961, Stirling from 753 in 1861 to 938 in 1931 and 1,315 in 1961, and Hastings barely, from 885 in 1881 to a low of 730 in 1921 and up again to 897 in 1961.

Chapter 5
FOREST INDUSTRIES

The oak and pine timber that grew along the shores and tributaries of so exceptional a water highway as the Trent attracted notice even before the start of the nineteenth century. In 1799, when it had been common practice for several years for potash, flour, wheat and other commodities to be carried downstream from areas beyond Kingston on timber rafts which were ultimately sold to Montreal and Quebec forwarders, an official British communique reported to London that "The river St. Laurance (has) .. Waters .. sufficient to carry the largest Rafts of lumber to the sea ports of this Province. And this lumber .. is .. a valuable Article of Commerce". Six years later, in a well-known "Sketch of His Majesty's Province of Upper Canada", D'Arcy Boulton wrote of "the lumber trade" as "of considerable importance to the country, being the cause of much money brought into the province."

Towards the end of the first decade of the new century, Napoleon's European blockade and the British loss of supplies of Baltic timber increased many times over the Quebec forwarders' demand for Upper Canadian squared pine and oak, and boards and planks. Despite the system of reserving the best timber stands found throughout the province for British naval purposes, and a contentious licensing system that lasted into the 1820's, lumbermen of all kinds made their way almost immediately into the Trent watershed.

In 1810, for instance, two contractors, Cumming and Macdonell, wrote to the Lieutenant Governor's military secretary, Major Halton, that they had "a wish of sawing some of the yellow Pine Timber which we have taken on the terms of our Contract, into Ship Plank", and that it would therefore be worthwhile for them to build a sawmill on the Trent in Seymour, where there were "many Trees which we have taken that fit [sic.] for nothing else, and a vast number felled in 1808 [sic.] which we could only take on [that] condition".

A few years later, Surveyor W. Browne reported to the Surveyor-General that he had experienced great difficulties in completing his work because of "The plunder of lumbermen [which] is prodigious". Some time afterwards he added "That there is more lumber at present [1821] made and making on that twp. than any former Year; this is a great grievance and if allowed with impunity must ultimately leave it of insignificant value".

Large quantities of stolen timber were seized. In just the month of April 1821, for example, a local sheriff reported seizing in Seymour from "persons unauthorized about six thousand Pipe Staves, five thousand feet of Square Oak timber, and four thousand West India Staves". Later in the same year he gave details of 76,500 "feet [of] Squared Norway", which he had taken in Seymour from lumbering parties of local men whose "procurers" included A. H. Meyers (whose saw-milling and other activities have been discussed earlier, listed as of Murray, J. Everet of Belleville, and A. B. McDonell of Glengarry.

Enforcement, however, was not sufficient to keep timber poachers out. The annual return for 1832, by way of example, showed that out of 10,332 cubic feet of white oak timber cut in Seymour again nearly half, or 5,130 cubic feet, was without license; as well, out of 62,059 cubic feet of white pine, 5,800, and out of 936 cubic feet of red pine 300 were without license. Even after settlement of the township by the retired military officers (mentioned above), surveyors reported continued depredations both there and in Percy and Rawdon Townships.

Samuel Wilmot, after his examinations of the area in 1837, commented with feeling that "the lumber has been plundered there from years since as the lumberers only look for the Timber trees and care nought whose land it is; their [sic.] not unlike a set of Pirates: They send their shanty parties into the Forest with instructions to get where they can find the trees growing but be careful not to be caught in the Act".

A good many settlers found work in the winter shanty camps a useful and sometimes necessary supplementary source of income, and also sold agricultural produce to them. Although from about the mid-1830's the advance of winter cutting operations to more distant regions made combining farming and lumbering more difficult, and despite the increasing numbers of former canal labourers who made a full-time pursuit of lumbering, members of farming families continued the practice for decades afterwards. W. H. Smith was only one of many who wrote disapprovingly of it when he passed through Northumberland County in 1850: "The inhabitants of these townships devote a great deal of attention to lumbering, to the neglect of their farms."

The square timber trade for the British market was always a speculative venture, even for those with capital to tide them over the bad times. The year 1840, for instance, was a bad one, during which local newspapers reported "serious losses" to lumbermen, made worse by the fact that the snow was gone by early March and much of the timber had to remain on the ground. In 1844 demand almost doubled, but by the late 1840's the lumbering industry was in a depressed state throughout the province, and informed opinion of the time was that the British market could be expected to continue an indefinite decline. In late 1849, however, financiers in Montreal, the commercial capital, remarked that "The Americans have entered the market this season, and have, up to the present period, purchased upwards of a million feet of square timber. The price obtained has been fifteen to twenty per cent above the Quebec quotations .. Large quantities of sawn timber have also been disposed of at an equally good figure." The market, they thought, had all the signs of being an expanding one.

The prognosis was in fact remarkably exact. The Americans, their own softwoods used up and demanding not only square timber but saw logs of all kinds that the Quebec forwarders would not take, imported millions of feet annually from the Lake Ontario ports during the decades ahead, thereby providing an alternative to the frequently unpredictable Quebec market. In 1850, approximately 5 million feet of lumber were shipped from Brighton alone.

But it was to Trenton (or Trent Port as it then was) that most of the timber was floated. Trenton in 1850 was still partially cedar swamp, and a boom was fastened across the river there to hold "lumber, of ... immence quantities", as an observer of the time put it, so that the community was "considered the head

Loading logs in the 19th century.

quarters of parties engaged in the lumber trade in this section of country [a sort of miniature Bytown]".

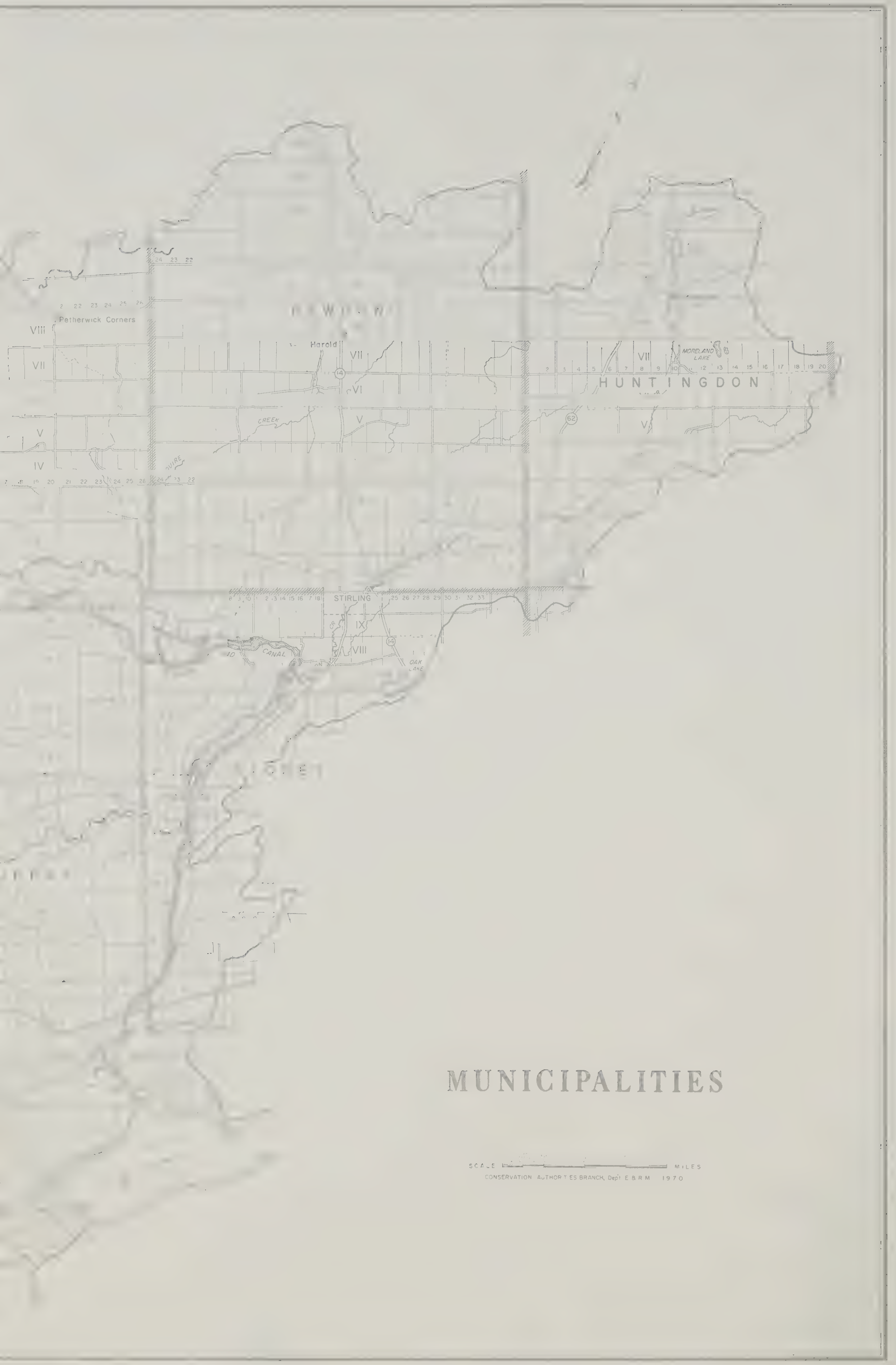
Belleville, where there was a customs office, acted as a general collection centre for the Trent and other surrounding areas. At mid-century, it shipped 10,648,000 feet of sawn lumber to the United States, and 4,395,590 feet of square timber destined for Quebec forwarders. With the building of north-south lines from the late 1850's, quantities of wood products were transported to the lake front by rail, and from there by water transport or by the main grand trunk east-west route. The latter line ran through Trenton, but the north-south routes followed the old portage and later road lines from Port Hope and Cobourg to Lindsay and Peterborough. In the four years after Confederation, the Midland Railway Company's freight listed to Port Hope showed more than 70 million board feet of sawn lumber for each year apart from 1869, when amounts were just over 64 million. Lists of cubic feet of square timber varied between 11,000 in 1869 and 788,000 in 1870.

Most of the cut by that time was taken far to the north and outside the Lower Trent, by large firms that also had interests in the Ottawa industry, but the area nevertheless continued to benefit from the processing and onward movement of the lumber to markets. In 1872-73, as the Commission of Conservation's "Trent Watershed Survey" of 1913 noted, Gilmour and Company's Trenton mill had a production of approximately 22 million board feet of pine lumber. The Gilmour mills had by far the largest operations in the whole of the Trent watershed, but at Hastings (founded by Henry Fowlds at mid-century and the centre of his lumbering activities from that time) there was a sizeable mill which sawed 1-1/2 million board feet of pine lumber. Other smaller operators were responsible for amounts of from one to a few thousand board feet.

By the end of the first decade of the twentieth century, the pine cut in the Trent watershed dwindled to one-tenth of the quantities of the 1870's and reforestation, which had been periodically reported on from the 1880's, replaced the old concept of the virtually inexhaustible forest. In 1911, the Ontario Legislature passed "The Counties Reforestation Act" which, subsequently amended and incorporated into later Acts, provided for local purchase and management of lands for forest development subject to overall provincial responsibility. In April 1955, an agreement under the legislation was arranged for Northumberland County and, by 1970, nearly 5,000 acres in the Authority area had become County Forest.

To-day, of course, logging is relatively insignificant in the Lower Trent region, although a number of sawmills operate and there is some contribution to the pulp and paper plant at Trenton.

MUNICIPALITIES
ALNWICK
PERCY
RICE
COLBORNE
BRIGHTON
BAY OF QUINTE



Petherwick Corners
Harold
HUNTINGDON
MORELAND LAKE
CREEK
STIRLING
CANAL
OAK LAKE
MUNICIPALITIES
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